JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

AUGUST, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

(Continued from Vol. xxxvii. page 365.)

CHAPTER VIII.

Comparative Results of Experiments made April 28th and May 3d, 1859, with other Experiments and Remarks thereon.

This Chapter is devoted to *Results* and their concomitants. And,

First. To the actual cost (in *coal*) of production of *steam* from water at 100° C. The grate and recipient heating surfaces, and the relative *weights* of coal employed.

Secondly. To the surface required for its condensation.

Thirdly. To its *abstract practical value*, irrespective of the means employed to make it available as a motor. If no one dreams of holding the *minter* responsible for the misuse of his manual coinage, why should another *minter* be held responsible for the misuse of his mental coinage? Enough for me to produce the steam and condense it economically, leaving to the mechanical engineer the responsibility of its application.

Steam has a fixed mercantile value, even as gold has, but it is far more liable to abuse; for all know the value of the latter, but few know any thing about the former as an article of merchandize.

Hence, I take no account (except incidentally) of the mere fact, that the *steam* in these experiments was actually used in a steam engine in the usual manner; but I must not omit the fact, that after having been so used, it entered the condensing apparatus perfectly dry, showing beyond all doubt, not only that there had been no priming, that no vesicular water had gone over with the steam; but also,

that there had been no condensation in the cylinder. When this has been done, all has been accomplished, which, in an economical point of view, superheating the steam admits of, although the advocates of the separate superheating ignore the fact, excepting the late Dr. Haycraft, who formerly belonged to that ultramontane party, but whose imitators do not appear to have attained one rational idea on the subject.

I shall institute, a comparison with my own, of the *evaporative effects* of two other boilers made and manned for the purpose, and shall show as conclusively as the case admits of, that no such immunity from priming, or going over of vesicular water with the steam, can be claimed for them, and therefore in comparing those boilers with mine, after making due allowance for the additional *total* heat in my steam as well as for its superheat, both of which operate equally in preventing condensation in the cylinder, my boiler is still compared with them at an unknown disadvantage, because it is impossible to divine how much *unconverted* water went over with their steam.

The proof offered is universal experience, which confesses that all ordinary boilers prime more or less, or carry over vesicular water with the steam. This point is too important to be passed over without further inquiry. Watt never knew what became of much more than half of the water which his boiler got rid of, at least he could only account for about that quantity as *steam*. The boilers of H. B. M. Steamer, the "*Bee*," took 1080 lbs. of water from a tank, but only 580 lbs.* were ever accounted for per indicator. The Manchester engineers, too, with the same system, have recently got out of their boilers 12·25 lbs. of water for 1 pound of coal consumed. But the Admiralty engineers who were sent to examine into the matter, although they were "*witnesses*" who saw sights of 11·05, 10·97, and even 12·44 lbs.† of water evaporated by 1 pound of coal, cruelly close their Report by observing that they "had some doubts as to the dependence that might be placed on the feed apparatus for the boiler, with reference to the exact quantity actually entering the boiler as measured to the feed apparatus and registered by the meter. Priming of the boilers was evidenced in an especial manner on the first and second day's experiments; it was not constant, but intermittent. Owing to these circumstances, we cannot place so much dependence on the accuracy of the results of the experiments as could be wished."‡

A very mild way, indeed, of intimating that the experiments were really of no value whatever, because the *palm* for evaporation must necessarily be given to the boiler which primed most.

What, then, are we to say to the reported evaporation of 15 pounds of water with one pound of coal? Not, certainly, that it is impossible; but it may just as well be made 20 or even 30 by *improving* the priming of the boiler; not that any of the ordinary multitubular ones are deficient in that *qualification*, by no means, but it is desirable to know how far it may be carried with a *pensive* public, so that we may as-

* The Indicator and Dynamometer by Main & Brown, page 31.
† Civil Engineer and Architect's Journal, April, 1859, page 122.
‡ See Mr. Isherwood's remarks. Also Journal Franklin Institute, Vol. xxviii, (3d Series,) page 262.

certain, not merely which feather broke the (humbug) camel's back, but the wretch who put it there. One would think, that a locomotive of *five hundred horse power** would do the job; but no, it won't, that has been tried and failed—make it camels then!!!

Is it not singular, that, of all the experiments made on the evaporation of water, there is not one recorded which shows, that any precaution had been taken against the water escaping, *unconverted*, with the steam? Few, indeed, take the trouble of recording any thing but the mere results, and for this you have only their *bare* word, which, in this matter-of-fact-age, is not of much account.

1st Report, 1844.

In the elaborate Report on the "*evaporative power*" of coals, made by Prof. W. R. Johnson, in 1844, by order of the Secretary of the U. S. Navy, the boiler employed was 30 feet long and 42 inches diameter, set in brick-work, with a furnace underneath it at one end, so as to expose 130 feet superficial to the action of the fire. Two 10-inch return flues containing 157 feet superficial within the boiler, brought back the products of combustion to the front over the furnace, from whence they escaped into the chimney stack, having been exposed to 287 feet superficial, of heating surface. But, by causing the gases again to traverse twice the length of the boiler, 90·5 ft. superficial more surface was obtainable, making 377·5 ft. superficial.

The grate had an area of 16·25 ft. = (5 × 3·25ft.) being as 1 to 17·66, and 1 to 23·23 of the recipient heating surface, according as to whether the one or the other of the above described methods was adopted. The grate also admitted of a reduction so as to make the proportion as 1 to 33·18 and 1 to 36·68 respectively. The grate bars were $\frac{3}{4}$-inch thick and $\frac{1}{2}$-inch apart. The consumption of fuel per foot of grate surface did not exceed 8 pounds per hour, and the pressure of the steam was less than 7 pounds per square inch above the atmosphere.

The highest evaporative effect with one pound of coal was 10·7 lbs. of water from 212° F., the whole steam from which was thrown into the chimney, as well as the products of combustion from a small furnace, to improve the draft.

2d Report, 1848.

In the no less elaborate experiments on the "Coals suited to the Steam Marine," by Sir Henry de la Beeche and Dr. Lyon Playfair, in 1848, by order of the British Admiralty, the highest evaporative effect from one pound of coal was 10·75 of water from 212° F., but the steam was allowed to escape without note or comment into the open air.

The boiler employed was set in brick-work. It was 12 feet long and 48 inches in diameter, with an internal flue 30 inches in diameter, at one end of which the furnace was placed; from thence the products of combustion passed to the other end, and returned alongside the boiler on the outside thereof to the front again, where they descended and passed under the bottom of the boiler to the chimney, after having operated upon 197·5 ft. superficial of recipient heating surface.

* Got up on the supposition that the steam pressure in the cylinder is the same as that in the boiler, and ignoring the "blast," and back pressure which it causes on the piston.

The grate was 2·5 ft. × 2 ft., giving an area of 5 ft. The grate bars were ⅜-inch thick and ½-inch apart. The grate surface was therefore as 1 to 39·5 feet of the recipient heating surface in the boiler.

The evaporation was about 80 lbs. of water to 1 foot of grate surface, which does not differ materially from the American experiments.

3d, My Boiler, 1859.

Now, my boiler differs in every conceivable respect from the two before described, for it has no grate properly so-called, but a hollow water-slab pierced with holes and short tubes expanded therein. The furnace is 17 inches square, and consequently has an area of 2 feet, on each foot of which, 16 lbs. of coal per hour was consumed, being about double the amount consumed on those before referred to, while the recipient water-heating surface is 100 feet superficial, with an additional 50 feet of steam superheating surface. This large superheating surface adds but little to the elasticity of the *steam*, but greatly to its safety, for inasmuch as the great immobility of steam, as well as of other gases, prevent rapid absorption of heat by them, a large surface is required, because limited to a low temperature on account of the danger attendant upon the reverse in the rapid corrosion of the boiler.

My boiler is of the upright multitubular kind, with tubular water leg furnace, hollow slab, and annular generator.

The condensing apparatus is of the slabannular kind, as shown by the colored plate attached to Chapter I, and with the boiler, has been examined by a Board of Engineers appointed by the Secretary of the United States Navy. The same Board have, as I understand, many reports to make on boilers and surface condensers* besides mine, which may thus cause some delay, and therefore I have thought proper, without anticipating their report on mine, to synoptisize a few of the facts elicited by those experiments, and principally such as will enable me to compare the "*evaporative power*" of my boiler with those before mentioned.

My boiler, be it remembered, has been in constant use more than two years, and on the trials did nothing but its ordinary every day work, while the others were new ones, I presume, and were certainly kept in special order for their work, and had philosophers to direct the firing.

The *modus operandi* adopted in the experiments will be understood by a reference to the colored plate before referred to, and the following observations.

[But previous to making them, I may be permitted to observe, that the tank method, or any other by means of which the water can be correctly measured into the boiler under examination, is the only correct preliminary to the obtaining of correct results, because, whatever may escape by steam leakage is just as much "evaporative effect" as that which is collected. Nay, even the water leakage of the *boiler* is so too, provided the heat from it dries it up and does not permit its collection.

* Why are not these reports, accompanied as they generally are, with correct drawings of the apparatus, published by the Secretary of the Navy? Some of them are invaluable. I may say, from the little that is known of them, that they are probably the most invaluable reports which our Government is in possession of on any one subject. Will not some of our Senators call them up, and redeem these invaluable papers from oblivion?

The main condenser was known to be much larger than necessary, inasmuch as the water flowing through it unchecked, would reduce the temperature so low as entirely to remove any pressure (above that of the atmosphere) in the exhaust steam pipe.

As no steam of any account would, under these circumstances, come from the bottom connexion of the main condenser with the reservoir, to interfere with the collection of the water of condensation therein, a cock was put into the reservoir at the same time that every other communication was cut off.]

The steam being allowed to leave the boiler and pass through the engine, deposited any oil, water, and any other substance heavier than steam in the "dirt trap." (NOTE.—The "dirt trap" varied a little from the one shown as the steam first struck an oblique plate forming one side of it, and had to ascend vertically before entering the condensing apparatus, thus rendering it impossible for anything but *pure steam* to obtain access thereto,) while the clean steam passed on becoming condensed in the main condenser, filled the reservoir below it up to the cock before mentioned. The water level in the boiler being noted, state of the fire, weight of coal to be supplied from, steam pressure and temperature of steam and water in boiler, temperature of feed water, and other observations amounting in all to about seventeen were taken every fifteen minutes.

We commenced to draw off the water of condensation from the "reservoirs" into a measure holding 8 lbs. of water, and poured its contents, when full, into a funnel fitted for the purpose of conveying the water to the feed pump, a mark being made for each 8 lbs. poured in under the *strictest* supervision.

Whenever the water-line in the boiler got lower than the level fixed upon, cold water was added to bring it up. Where this additional water went to was a matter of surprise, for not a particle of steam could be discovered leaking from the boiler, but as the supply required increased with the boiler pressure, it may be that the principal escape was there. There are, however, several connexions where a slight escape of steam was visible under a pressure of 210 lbs., at which sometimes the boiler blew off in consequence of stoppages; boiler water will waste very rapidly, although scarcely perceptible to the eye or ear. There was a little water overflow at the feed pump, but of no collectable amount. Blowing through the cylinder twice every fifteen minutes in taking indicator cards, would, I am sure, waste more than all the water which escaped from this source. The presumed greatest source of water escape on the first day was the suction pipe of the feed pump, which was under a pressure of only 3 to 4 feet of water; that was remedied, but the deficiency of water was increased on the next day, showing that the leakage was somewhere else, for it increased with the increase of pressure. The boiler stands upon four legs, is clear all around it, and admits of thorough examination. These are the reasons why I claim that all the water which entered the boiler was evaporated in effect by the action of the fuel consumed.

Prosser's Patent Boiler and Condenser.

Synopsis of the performance of the boiler and condenser, while under charge of a Board of United States Engineers appointed by the Hon. Isaac Toucey, Secretary of the Navy, and consisting of B. F. Isherwood, Esq., senior member of the Board, and late Chief Engineer of the war steamer "*San Jacinto*," J. W. King, Esq., Chief Engineer of the Brooklyn Navy Yard, and Wm. E. Everett, Esq., late Chief Engineer of the war steamer "*Niagara*."

These trials of the boiler and condenser were continued during six days, occupying eight consecutive hours of each day, but this synopsis embraces only the two last of those days, and will doubtless be found to agree with the Report of the Board when forthcoming, so far at least as they may be comparable with each other.

Synopsis.

Averages of observations taken every fifteen minutes.

Notes.			Steam Full pressure	Steam Expand 2 7-9th times.
	The Manometers used were made by the Novelty Works. Temperature of the atmosphere from 70° to 80° Fah.	1859	April 29.	May 3.
	Coal consumed per hour on each foot of grate surface in	lbs.	16	16
	Load on safety valve of boiler per square inch,	"	150	210
	Total pressure of steam in boiler "	"	145	157
a.	Superheat of the steam in the boiler above the water,	F.	17°	49°
	Lowest total pressure in the steam chest per square inch,	lbs.	51	118·7
	Highest " of the exhaust steam "	"	16	16·4
	Initial pressure of unbalanced steam in the cylinder,	"	35	102·3
b.	Weight of water collected from *steam* condensed after passing into the condensing apparatus per pound of coal consumed,	"	10·019	9·8928
c.	Weight of water collected from *steam* condensed before entering condensing apparatus (in dirt trap),	"	·012	none.
d.	Weight of water added to keep up the water level in boiler "	"	·750	·9642
e.	Weight of water evaporated per pound of coal consumed,	"	10·781	10·857
f.	Temperature of exhaust steam in heater cistern,	F.	212·36°	213·64°
	" of feed water previous to entering the heater,	"	122·°	148 °
	" increased by passing through the heater,	"	62·3	38·8
	" of the feed water entering the boiler,	"	184·3	186·8
	CALCULATION FOR EVAPORATION.			
	Centigrade Thermometers made expressly for the purpose by Tagliabue.			
	Weight of water forced into the boiler by the feed pump (first hour of last day lost),	lbs.	2760	2432
	Weight of coal consumed in the evaporation thereof in eight and seven hours respectively,	"	256	224
	Weight of water evaporated from 84·6° C. to 175° by one pound of coal as above,	"	10·781	
	Weight of water evaporated from 85·96 C. to 183·5° by one pound of coal as above,	"		10·857
	Total heat in atmospheric steam above 100° C.—	C.	537·°	537·°
	" of feed water less than 100° C. (—84·6),	"	15·4	
	" " " (—85·96),	"		14·04
	Superheat of *steam* above the water reduced to its equivalent in proportion to its specific heat,	"	8·	23·
	Total heat in steam at 175° C. above that at 110° C.,	"	19·85	
	" " 183·5° C. " " "	"		22·46
	" absorbed from the combustion of the fuel,	"	580·25	596·5
	Divided by 537° gives coefficient of the real evaporative effect,		1·0805	1·1108
	Which multiplied by the observed evaporation as above,		10·781	10·857
	Gives an evaporative effect from 100° C. per pound of coal of	lbs.	11·65	12·06

Notes on the foregoing Synopsis.

a. Superheating the steam and its effects.

These quotations are the best approximations attainable. The thermometers could not be put exactly into either the water or the steam of the boiler, and an allowance is therefore made to bring the temperature up to correspond with the pressure.

If this steam was not pure, where are we to obtain it? Surely not from the *test* boilers, either American or English, which I have described, unless indeed we are prepared to back the *gross* insinuation, that the tables used to show the relative volumes of steam and water may possibly be wrong to the extent of even "*one-half.*"*

The increased amount of superheat in the steam on the last day, may be accounted for by the fact, that the smoke tubes and passages were thoroughly swept out the day before, whereas, on the first day's trial they had not been swept for two weeks.

Superheating the steam is one of the main objects of the boiler arrangement, at the same time it is believed to be the lightest, strongest, and most effective steam (real steam) generator ever produced. This is the boiler referred to in this *Journal*,† and with which I challenged any boiler in the United States to compete. It has now been more than two years in constant use; it is not in the least impaired, and is fully adequate to the bursting of any other boiler in existence that I know of.

Nearly all tubular boilers are known to prime badly. That is their greatest fault, and yet, we find the evaporative effect of boilers tested in such a manner as to induce the belief that priming was a desirable qualification, and those boilers which primed the most are usually extolled as evaporating the most.

The water being measured from a tank and pumped into the boiler, the sooner it was got out again through the cylinder, the better for the character of the boiler.

The remedy for priming is undoubtedly superheating the steam. There is no priming when that is properly effected.

b. It is not so much the water that goes into the boiler which is of any importance, but *the steam which can be caught uncondensed after it has left the cylinder* that we want to know about, for that is the steam, and that only, which has done the work. Of course, it is not possible with a jet condenser to ascertain this, and the only alternative is to measure it by the indicator.

The system which I here recommend is entirely trustworthy, for, between the cylinder and the condenser, with the means of separating the steam from the water, from whatever source the latter may be derived, there can be no possible source of error unless it be against the boiler, because, even if the condenser is leaky, the pressure on the inside of it being greater than on the outside, the condensed steam will be blown out rather than the condensing water drawn in.

To this test for evaporation my boiler has been subjected, and it is not too much to say, that there are many boilers of fair repute which will not furnish steam of equal efficacy with double the amount of fuel.

This water is from pure steam beyond all cavil. It is the first time to my knowledge, that the test of collecting the steam alone and condensing it, has ever been applied to the verification of the tank system of measuring the water before entering the boiler. I think it much more accurate than the indicator method.

The experiments were undertaken to test the boiler and condenser, and not the steam engine; the latter was merely made use of as a medium to pass the steam from the boiler, but was not indispensable or even necessary, except as furnishing the power necessary to pump back the water of condensation into the boiler.

To submit to the arbitration of the indicator, is to add all its faults and deficiencies to those of the engine, boiler, and condenser, whatever they may be, which the boys would call "going it blind."

It may be as fair for one as another of the same breed of boiler and condenser, but who puts his full-blooded courser to pull against a cart horse? My boiler produces undeniably pure and superheated steam; use it and let me have it back to condense and return to the boiler again as pure as the mountain dew. But what have I to do with the want of skill in the user of it, or with any fanciful mode which may be adopted of testing its power!

Even if the steam engine and the indicator were both perfect, there can be no benefit derived from their use, as mere measures of the weight of steam passed, for we obtain the absolute *steam* condensed into water to weigh and to measure as we please; all the loss is against the boiler, there can be no other error. No other system admits of this

* Indicator and Dynamometer by Main & Brown, page 32.

† Vol. xxxiv, (3d Series,) pages 201 and 202.

absolute certainty, nor, indeed, of any approach towards it, and hence the imperfect instruments which are indispensable to the testing of their power, only insures error in this case where truth is much more easily obtained by other means.

For, where a pound of steam has any fixed value, and we are sure that we get it, we are in possession of a *fixed standard*, with which no other can compare for accuracy.

c. This shows, that the superheat of 17° F. to steam of 145 lbs. total pressure, is nearly sufficient to prevent the appearance of water in the "*dirt trap*," and therefore for all practical purposes we may consider that 10 lbs. of steam may be calculated upon from 1 lb. of coal, of a quality usable, with as much certainty as a permanently elastic fluid, for it is quite obvious that there need be no condensation in the cylinder.

Now let it be insisted upon, that the question of the pressure of the steam is comparatively an important one; it is the weight that we want to be sure about, and having got that, a considerable difference of opinion about the pressure will not materially affect results; only allow that it is steam of the quality represented, and then, whether its elasticity is represented by 95 or 100 lbs. to the square inch, will make comparatively but little difference in the result of a calculation of its power, for within any reasonable limits the product of the pressure multiplied by the volume will show little variation, for what is gained in pressure will be nearly lost in volume.

d. The difference in these quantities is doubtless owing to the increased tension of the steam causing more steam leakage somewhere, and if within the boiler, then to the improvement of the draft, and much cheaper than by the blast-pipe. But the leakage is a mystery nevertheless, for if a boiler like this one leaks almost imperceptibly from 7·8 to 8·6 per cent., what must ordinary boilers leak? There is a well-grounded suspicion that *steam boilers leak far more than is generally imagined*, even when not a drop of water is visible. This alone seems to account for the large quantity of recuperative supply, which every boiler connected with a surface condenser is reported to require, and may also relieve the boiler of the "*Bee*" of a portion of the obloquy attached to it.

e. Even this amount exceeds any well authenticated *real* evaporative effect ever produced by any boiler, in ordinary working and without priming, and yet we have to add several items to it, before it is fairly placed for comparison with the two boilers before mentioned, to wit: the deficient temperature of the feed water, the increase of heat (superheat) in the steam beyond its normal amount, and also the additional total heat in the high pressure steam which was produced. These two last items effectually prevent condensation in the cylinder, and therefore supersede the necessity of superheating the steam by a separate apparatus, or of surrounding the cylinder with a steam jacket, for it accomplishes their work in a far more economical manner, with entire safety, efficiency, and convenience.

f. It has already been explained, that these temperatures were kept down, for the purpose of conveniently withdrawing the water of condensation. This occasioned considerable reduction in the temperature of the feed water, which in the ordinary way of working is actually 200° F., and although it may be increased, the conviction now is, that a higher temperature is not desirable at present, for when working thus, the exhaust steam has sufficient tension to go over into the still and produce distilled water of twice the weight of fuel consumed, which is deemed sufficient for any emergency.

(To be Continued.)

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*Lubricating Railway Brakes.**

According to an invention patented for a correspondent by Mr. Johnson, it is proposed to use, in connexion with any suitable lubricating apparatus, a capillary pad or cushion composed of wool, cotton, or other suitable material, and combined with a metallic conducting spout, which is pressed against the underside of the enlargement or shoulder of the journal of the axle or shaft. This pad sucks up the excess of oil which always collects at that point, and causes it to return either to the elevator or reservoir, so that there will be no waste of oil beyond a few drops occasionally. The pad should always be placed above the level of the oil, so that it will remain in a comparatively dry state.

*From the London Mining Journal No. 1236.

For the Journal of the Franklin Institute.

Experiments made by order of the Navy Department to Determine the Relative Advantages and Disadvantages of the Horizontal Fire Tube, and of the Martin Vertical Water Tube Boiler on board the U. S. Steam Frigate "San Jacinto."

When the U. S. Steam Frigate "*San Jacinto*" returned to New York from her late three years' cruise in the East Indies and the China Sea, a survey was held on her old flue boilers, and their condition was found to be such that it was deemed judicious to replace them with new tubular ones. A convenient opportunity was thus furnished to make a test of the comparative evaporative efficiency of the two competitive kinds of tubular boiler, and the vessel was accordingly fitted by the Navy Department with one horizontal fire tube boiler and one vertical water tube boiler; they have recently been experimented with by a Board of Chief Engineers, whose report is given below. It will be interesting to preface that report with a short description of the old boilers in order that the results of the change may be correctly appreciated.

The old boilers were three in number and of copper. They were of the double return drop flue type, and were placed in the vessel side by side with one chimney in common at the end opposite the furnaces. The fire room was 8½ feet wide and extended athwartship.

Length of each boiler,	25 feet 6 inches.
Breadth "	9 " 9 "
Height " (exclusive of steam chimney,)	10 " 6 "
Number of furnaces in each boiler,	2.
Width of each furnace,	4 " 2½ "
Length of fire grates,	7 " 9 "
Total grate surface in the three boilers,	197·8 square feet.
" heating " "	5250· "
Aggregate cross area of the upper row of flues in 3 boilers,	35·133 "
" " middle " "	33·008 "
" " lower " "	32·146 "
Cross area of the chimney,	34·039 "
Height of the chimney above the grate bars,	55 feet.
Capacity of steam room in the three boilers,	2440 cu. ft.
Weight of the three boilers without chimney and grate bars,	213,256 lbs.
Weight of water in the three boilers at 12 inches above flues, and at 250° Fahr.,	121,200 "

With these boilers during the last three years' cruize of the vessel in the East Indies and China Sea, there was obtained the following mean results, namely:—

Number of pounds of Pennsylvania anthracite consumed per hour,	2115·00
" " " " per sq. ft. of grate,	10·69
Waste in ashes, clinker, and fine coal,	25 per centum.
Pounds of water evaporated per pound of anthracite from tem. of 100° F.,	6·00
" " " combustible " "	8·00

The economic evaporation by the new horizontal fire tube boiler, according to the experiments referred to, exceeds the above by 11⅛ per centum, making the comparison by weight of combustible; and by 11½ per centum if it be made by weight of coal: while the evaporation by the vertical water tube boiler exceeds it by 31¾ per centum per

unit of weight of combustible; and by 29⅔ per centum per unit of weight of coal.

By the change of boilers the ship carries in the same space as originally allotted to the machinery and fuel, 40 tons more coal, increasing the quantity from 320 to 360 tons.

The aggregate weight of the original boilers and water was 149$\frac{3}{10}$ tons; with the present boilers this weight is 115$\frac{7}{10}$ tons.

It will be perceived that while with the present boilers, the aggregate weight of boilers, water, and fuel exceeds the aggregate weight of the original boilers, water, and fuel by only 6⅔ tons, the time that the vessel can steam at the rate of 175 geographical miles per twenty-four hours, has been increased from 14 to 18 days.

The original boilers were about eight years old, and the middle and lower return flues and their connexions, comprising about two-thirds of the total heating surface, were covered during the whole cruize with old scale varying from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick. This surface was inaccessible for scaling, and from the condition of the seams it would have been injudicious to have attempted it. No new scale was formed during the cruize, as the surface condenser operated satisfactorily.

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Navy Yard, New York, June 24, 1859.

Hon. ISAAC TOUCEY, *Secretary of the Navy.*

SIR:—In obedience to your order of May 17th, 1859, the undersigned have experimented with the vertical water tube and the horizontal fire tube boilers on board the U. S. Steamer "*San Jacinto*," in the manner and for the purpose therein directed: and have the honor to submit the details of the experiments and their results in the following REPORT.

Before giving an account of the manner of conducting the experiments, and the data obtained—it will be satisfactory to preface it with the following brief description of the boilers and engines employed.

Boilers.—The two boilers had precisely the same shell, both as regards form and dimensions. Also, the furnaces, ash-pits, doors, and smoke connexions were precisely alike, and the grate bars were cast from the same pattern. The minimum calorimeter or area for draft through the tubes was likewise the same in both boilers; the fire grate surface employed was of the same area; and both boilers delivered in common into one smoke pipe, placed at the centre of their length, and immediately over the fire room. The boilers were situated in the vessel face to face, with a fire room 8½ feet wide between them, and extending in the direction of the vessel's length.

As regards dimensions, the only difference between the boilers was in the heating surface, which was considerably the greatest with the vertical water tube boiler.

As regards design, the only difference between the boilers was in the arrangement of the tubes, which in one, was according to the type known as the English tubular or the horizontal fire tube boiler; while in the other, it was according to the patent of Chief Engineer, Daniel B. Martin, U. S. N., and is of the vertical water tube type.

In both boilers the relative positions of tubes and furnaces are the same, the tubes being placed immediately over the furnaces; and in both boilers the tubes occupy sensibly the same space, namely: a length of 7 feet, a breadth of 3 feet, and a height with the horizontal fire tubes of 37 inches, and with the vertical water tubes of 33 inches; but this difference of 4 inches is compensated by the greater distance between the tubes and furnace crown indispensably necessary with the latter.

The comparative dimensions and weights of the boilers will be found in the following Table:

Dimensions and Weights of Boilers.

	English horizontal fire tube boiler.	Martin's vertical water tube boiler.
Width of boiler (fore and aft direction of the vessel,) in feet and inches,	21 3	21 3
Length of boiler (athwartships) at furnaces in ft. and ins.,	10 6	10 6
" " " extreme " "	11 6	11 6
Height of boiler exclusive of steam chimney in ft. and ins.,	11 3	11 3
" inclusive " " "	13 3	13 3
Number of furnaces,	6	6
Width of fire grate in each furnace in feet,	3	3
Length " " "	6	6
Aggregate area of fire grate surface in square feet,	108	108
Heating surface in the six furnaces, in square feet,	289·20	289·20
" " back smoke connexion, "	159·36	119·36
" " front " "	136·40	106·40
" " tubes measured on their exterior circumference in square feet,	2282·67	2332·64
" " tubes measured on their interior circumference in square feet,	2078·92	2111·00
" " sides, tops, and bottoms of the tube boxes in square feet,		447·65
Total heating surface, the tube surface being measured on the exterior circumference in square feet,	2867·63	3295·25
Total heating surface, the tube surface being measured on the interior circumference in square feet,	2663·88	3073·61
Number of brass tubes,	414	1620
External diameter of the tubes in inches,	3	2
Internal " " "	2·732	1·810
Length, in inches of the tubes, extreme,	84½	33
Thickness of metal of the tubes in inches,	0·134	0·095
Weight of the tubes in pounds,	10115	9856
Calorimeter or area for direct draft through the tubes in square feet,	16·854 } 16·854 }	16·889 front 21·555 back.
Diameter of smoke pipe in feet and inches,	6 4	6 4
Height " " " above fire grate,	51 6	51 6
Steam room measured from nine inches above top of tubes in cubic feet,	735	776
Weight of water in boiler at 250° Fahr., measured from 9 inches above top of tubes in pounds,	46600	39200
Weight of boiler exclusive of water, grate bars, and valves, but inclusive of tubes in pounds,	86412	86860
Length occupied by the tubes in each boiler in inches,	84½	84½
Height " " "	37	33
Space between crown of furnace and bottom of tubes in inches,	7	9

Engines.—The engines are geared, and the cylinder valves are of the usual double poppet kind. The steam is cut off by the steam valve with the adjustable arrangement patented by Allen & Wells. The two cylinders are connected upon the driving shaft at right angles to each other; and they have in common one surface condenser constructed according to the patent of J. P. Pirsson.

The following are the dimensions required to be known in connexion with the experiments, namely:—

Diameter of the forward cylinder,	70¼ inches.
" after "	70⅜ "
Stroke of piston of both engines,	4 feet.
Aggregate area of both pistons,	7752 sq. ins.
Space displacement of the pistons of both engines per stroke,	215·33 cu. feet.
Space comprised between pistons and cut off valves at one end of both cylinders,	9·61 "
Total space filled with steam of the final cylinder pressure, per stroke of both pistons,	225·94 "

Mode of Conducting Experiments.—The experiments were made to determine the *relative* evaporative efficiencies of the two boilers under the conditions of actual practice on board marine steamers. For this purpose a short experiment would be valueless from the impossibility of knowing whether the condition of the fires was exactly the same at the commencement and at the end—from the inequality in firing—from the different proportions of refuse found even in different shovelfulls from the same heap of coals—from fluctuations in the draft—from the losses by cleaning the furnaces—and from the different quantities of air in proportion to fuel admitted at different times. It was, therefore, considered necessary that the experiments with each boiler should continue uninterruptedly four days or ninety-six hours. The weight of water evaporated was to be ascertained from the steam pressure in the cylinder at the end of the stroke of piston as given by the indicator. The cost of this evaporation was the weight of combustible consumed; by combustible is meant the remainder of the coal after deducting the refuse withdrawn from the furnaces as ashes, clinker, and fine coal.

The evaporation as thus determined, though relatively correct, is not absolutely so; because it is exclusive of the steam condensed in the boiler, in the steam pipes, in the cylinders, &c., and of the loss of heat by priming and leakage; but on the other hand, the evaporation measured by water in a tank previous to its entering the boiler would also be incorrect from the loss by priming and from leakage. The tank measurement gives too great an evaporation, the indicator measurement too small a one; but the latter is the most useful practically, because the most convenient and habitually employed; in effect, it is only comparative results that could be obtained in either case, and they are all that are practically needed.

The experiments were conducted in precisely the same manner with both boilers, and as follows, namely: At the commencement no account was taken of the coal required to raise steam, or of the temperature of the water in the boilers; but after steam was raised to 22 lbs.

per square inch pressure above the atmosphere, the level of the water in the boilers was noted, the condition of the fires estimated as nearly as possible by the eye, and the engines started. At the end of each experiment, the water in the boiler and the condition of the fires were left as at the commencement. The experiments with both boilers were begun and ended at mid-day, and continued uninterruptedly ninety-six hours. During that time, the boiler steam pressure and the vacuum in the condenser by barometer gauges were noted every fifteen minutes, and at the close of each hour there was recorded for that hour the mean steam pressure, vacuum, temperature of engine and fire-rooms, of the salt and fresh water hot-wells, and of the injection water; also the weight of coal thrown into the furnaces, and the weight of dry refuse in ashes, clinkers, and fine coal withdrawn. Each hour an indicator double diagram was taken from both cylinders, and from the mean of the final pressures as given by these diagrams the evaporation was calculated. Owing to excessive condensation in the cylinders and the continual discharge by their relief valves of the resulting fresh water, the surface condenser gave a deficit of one-sixth, that is to say, it returned to the boiler as distilled water, five-sixths of the steam leaving it. At the commencement of each experiment the boiler was filled with sea water, and at the expiration of every hour the saturation was recorded, and also the number of inches in depth of water blown off to maintain it at $1\frac{1}{2}$ times the natural concentration. Every pound of the coal and refuse was carefully weighed by a steelyard. The number of double strokes made by the piston was taken by a self-registering counter. The indicators were excellent instruments, and every precaution was taken to insure exact similarity of circumstance with both boilers. The cut-offs set to cut off the steam in the cylinders at $\frac{48}{100}$ of the stroke of piston from the commencement, were secured to prevent accidental alteration. The throttle (a butterfly valve) was kept unchanged at two holes open, eight holes being wide open. The same fireman fired both boilers and the same assistant engineers directed them.

The experiments were first made on the horizontal fire tube boiler; they were begun at noon on the 10th of June, and after being completed, the steam was shut off from it and let on from the vertical water tube boiler without stopping the engines. The piston and cylinder valves of both engines on being tried at the termination of the experiments, noon June 18th, exhibited no sensible amount of leakage.

The coal used was hard Pennsylvania anthracite of very indifferent quality, giving for a mean with slow combustion and careful firing, the excessive amount of over 25 per centum of dry refuse.

In the following Table will be found the complete data and results of the experiments:

Data and Results of the Experiments.

DATA.	English horizontal fire tube boiler.	Martin's vertical water tube boiler.
Duration of the experiments in consecutive hours,	96	96
Total number of double strokes of pistons made by the engines per counter,	62518	64196
Mean number of double strokes of pistons made per minute by engines,	10·854	11·145
Mean pressure of steam in boiler in pounds per square inch above atmosphere,	10·43	11·41
Mean vacuum in condenser in inches of mercury, per barometer gauge,	21·48	20·80
Total number of pounds of anthracite consumed,	100436·00	92512·00
" " refuse in ashes, clinkers, and fine coal,	24908·00	24178·00
" " combustible consumed,	75528·00	68334·00
Per centum of the anthracite in refuse,	24·80	26·14
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam in cylinders at commencement of stroke,	19·44	10·40
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam in cylinders at point of cutting off,	16·40	17·20
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam at end of stroke of piston,	9·11	9·50
Mean gross effective pressure on pistons in pounds per sq. inch, per indicator,	9·18	9·63
Mean back pressure above zero against pistons in pounds per square inch, per indicator,	5·50	5·75
Mean gross horse power developed by the engines,	187·25	201·696
Mean number of pounds of anthracite consumed per hour,	1046·21	963·67
" " " " per square foot of grate,	9·687	8·923
Mean temperature in degrees Fah. of the engine room,	96	106
" " " on deck,	61	74
" " " of the fire room,	99	112
" " " salt water hot-well,	100	102
" " " fresh "	100	100
" " " injection water,	62	65
Total number of pounds of water blown out of boiler to keep the saturation at $\frac{1\frac{1}{2}}{32}$.	68424	123144
RESULTS.		
Number of pounds of water evaporated from feed water temperature of 100° Fah., calculated from the steam pressure in cylinder at end of stroke,	663629·007	705468·426
Number of pounds of water evaporated from feed water temperature of 100° Fah., due to the weight of boiler water blown off,	8183·448	14857·488
Total number of pounds of water evaporated from feed water temperature of 100° Fah.,	671813·455	720325·914
Pounds of water evaporated from feed water temperature of 100° Fah. by one pound of anthracite,	6·689	7·786
Pounds of water evaporated from feed water temperature of 100° Fah. by one pound of combustible,	8·895	10·541

Comparative advantages and disadvantages.—We are directed by your order to report to the Department the relative advantages and

disadvantages of the two kinds of boiler as regards space occupied, weight, cost, accessibility for cleaning and repairs, durability, evaporative efficiency, and the relative quantities of steam that can be furnished in equal times.

1st, *As regards space.*—In the particular specimens experimented on, the space occupied by both types of boiler was equal; but not so the area of contained heating surface. If the proper measure of that surface be, as we think it is, the extent exposed to the reception of heat from the products of combustion, then the heating surface in the vertical water tube boiler exceeded that in the horizontal fire tube boiler by nearly 23¾ per centum of the latter. If, however, it be measured by the extent from which water is evaporated, then the superiority will still remain with the vertical water tube boiler but reduced to 7⅛ per centum.

2d, *As regards the weights of the two boilers.*—By referring to the table of their dimensions and weights, it will be seen that in this respect the experimental boilers were nearly equal, the horizontal fire tube having a slight advantage in lightness; but if the aggregate weight of boiler and contained water at a steaming level be compared, then the vertical water tube has a superiority of nearly 5¼ per centum over its competitor.

3d, *Cost.*—In this particular the horizontal fire tube boiler is slightly the cheapest, but the difference is unimportant.

4th, *Accessibility for cleaning and repairs.*—For the removal of scale or any insoluble sediment on the water surfaces of the tubes, the vertical water tube boiler has a decisive superiority, from the complete and easy manner in which the entire of those surfaces can be reached by a scaling tool and cleaned mechanically. With the horizontal fire tube boiler, this operation is very tedious and difficult, and at the best is only partial. It may, indeed, be said, that the whole of the horizontal tubes cannot be scaled without the removal of a portion of them; and from the fact of their becoming more and more coated with scale as their age increases, their evaporative efficiency will be continuously impaired to the extent of the loss of heat thus intercepted. On the other hand, the horizontal fire tubes are much more easily and completely swept of soot and deposit from the furnaces; they are also more easily plugged when leaking. Furthermore, they are only about one-fourth the number of the vertical water tubes, and the liability to leakage is correspondingly lessened, but this liablity is so trifling as to be of no value in a practical estimate. The remaining portions of both boilers are equally accessible for cleaning and repairs.

5th, *Durability.*—We have no data on which to base an opinion in this respect, but we believe both boilers to be about equal.

6th, *Evaporative efficiency.*—The relative evaporative efficiency as given by the experiments, applies rigorously only to the particular specimens of the types of boiler employed, with their peculiarities of proportion, and under the conditions of the trials. Under other conditions, and with other proportions, the relative evaporative efficiency would doubtless be different, and in direction as determined by better or worse

proportions, and by conditions more or less favorable for one kind of boiler over the other. The proportions given to both boilers in the present case, however, are such as are now generally approved in practice.

With these proportions, and under the actual conditions of the trials, the evaporative efficiency of the vertical water tube boiler exceeds that of the horizontal fire tube by $18\frac{1}{2}$ per centum of the evaporation of the latter, making the comparison by weight of combustible consumed; and by $16\frac{2}{3}$ per centum if the comparison be made by weight of coal consumed; the former is, of course, the proper result.

7th, *Relative quantities of steam that can be furnished in equal times by the two boilers.*—In this respect the superiority remains with the horizontal fire tube boiler in which the combustion of the fuel can be forced to a considerably greater extent than in the vertical water tube boiler. The additional steam, however, thus obtained, will be at a greater *pro rata* cost of coal; but we have no data to determine either the increased quantity or its increased cost.

Finally, in view of the much greater evaporative efficiency of the vertical water tube boiler, and of the facility and completeness with which it may be scaled—the two qualities of paramount importance with marine boilers—we would express our decided opinion that its superiority over the horizontal fire tube boiler is so strongly marked as to unquestionably entitle it to the preference.

We have the honor to be, sir, with great respect,

Your obedient servants,

B. F. Isherwood, Wm. E. Everett,
James W. King, John Faron,
Chief Engineers, U. S. N.

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*On the Relative Values of Coke and Coal in Locomotive Engines.**

By Benjamin Fothergill.

Having attended a meeting in the Society's rooms, on 2d December, 1857, and taken part in the discussion relating to the use of coke and coal in the furnaces of steam engine boilers, I then undertook to lay before its members the results of a series of experiments which I had made with coke and coal in locomotive engines in corroboration of the truth of my assertions:

First, That coal was decidedly superior to coke in respect to heating power, and consequently more economical.

Second, That a plentiful supply of steam could be generated by the use of coal for working engines at high velocities and for drawing heavy trains.

Third, The capabilities of coal-burning engines for consuming their own smoke: and,

* From the Jour. of the Society of Arts, No. 339.

Fourth, The increased durability of fire-boxes and tubes when coal was used.

On that occasion I stated, that my experiments had been conducted upon the London and South Western Railway, and were made, at the request of the directors, to ascertain the value of an invention which had been patented by their Locomotive Superintendent, Mr. Joseph Beattie. This contrivance will be readily understood by referring to the drawings on the walls, where the fire-box is shown in section, divided transversely into two compartments by an inclined water space mid-feather or diaphragm, and a dependent water space hanging from the roof. Both compartments are arched over with fire tiles at narrow intervals apart. The boiler is constructed with a combustion chamber, extending to about one-half its length, and it has a vertical mid-feather or diaphragm in the centre running parallel with its sides. The other half is supplied with tubes in the ordinary manner. The object of this contrivance is to increase the amount of direct heating surface and to diminish the indirect or tube surface, whilst the combustion chamber affords sufficient space for the introduction of a series of fire tiles, for the purpose of retaining a portion of the heat given off from the combustion of the gases in the fire-box, and for diffusing the unconsumed carbon as well as effecting a complete mixture of the air with the gases, and thereby producing a mass of flame which is brought in contact with the direct heating surface of the combustion chamber before it enters the tubes, at the same time preventing practically such an escape of smoke from the chimney as could be deemed a nuisance.

The back or first furnace is the most actively worked, the second being intended to carry incandescent fuel. The ash pans are furnished with dampers for the admission of air when necessary; and this is also admitted through the small apertures in the fire doors and through hollow stays in the fire-box.

In addition to the mechanical contrivances referred to, Mr. Beattie has another of considerable importance for using a portion of the exhaust steam for heating the feed water before it enters the boiler, and as I have tried both his contrivances for this desirable object, I need only refer to the one represented on the drawing, which shows the pipes for conveying the water and steam to the tank under the foot-plate of the engine, from which the feed-pumps receive their supply. The water is received on to a perforated plate in this tank, and in its descent comes in contact with and condenses the steam, and thereby becomes heated; the supply of water is regulated by the ball-tap or valve, and the steam is admitted or shut off whenever the engine driver has occasion to supply or shut off the feed-water to the boiler.

In the course of my first series of experiments, I have used the feed-water supplied by Mr. Beattie's apparatus, at a temperature of 196°.

I may here observe that I was anxious to obtain an analysis of the fuel used by the London and South Western Railway Company, and the more so as I found they manufactured their own coke from "Ramsay's Coking Coal" (Newcastle), which is of a superior quality; and

as it was desirable to ascertain, as far as possible, whether the coke or the coals which were supplied to me contained the greatest amount of sulphur, I sent samples of each to Mr. Dugald Campbell, Analytical Chemist to the Brompton Hospital, and he, after a careful examination, furnished me with the following statement, viz:—

"The samples I received were four in number, and marked as follows:—

No. 1.—Ramsay's coking coal.
No. 2.—Coke.
No. 3.—Llanguathog Merthyr, shipped Swansea, Neath, and Cardiff.
No. 4.—Griff coal.

"No. 1.—Ramsay's Coking Coal—Is of a jet sparkling appearance, and is broken up without much difficulty by the fingers into rather thick layers, between most of which are thin plates of iron pyrites, which, I may state, is a compound of iron and sulphur, in the proportion of one of the former to two of the latter. When the coal is reduced to a very fine powder—in which state it is required for analysis—its jet black appearance gives place to a considerable brown tint, which indicates it to be of a bituminous character.

"This coal is rather above the usual density of Newcastle coal, being 1279, water taken as 1000.

"The analysis in 100 parts is as follows:—

Carbon,	85·57
Hydrogen,	5·68
Oxygen,	3·07
Nitrogen,	1·48
Sulphur,	1·46
Moisture,	0·74
Ash,	2·00
	100·00

"The calorific value of a substance is generally estimated in two ways; firstly, by calculating from its ultimate analysis what quantity of water a known weight of the fuel would evaporate from 212° Fah.; and, secondly, by ascertaining how much oxide of lead is capable of being reduced to the metallic state by a known quantity of the fuel.

"These experiments when conducted upon the different specimens of fuel under precisely similar circumstances, which has been the case in this instance, give results extremely useful for comparing the economic value of the fuel. By such means, 1 lb. of No. 1 Ramsay's coking coal was found to be capable of evaporating 15·18 lbs. of water from a temperature of 212° Fah., and 1 lb. of reducing 34·99 lbs. of metallic lead from the oxide.

"No. 2.—Coke made from Ramsay's Coking Coal.—The specimen I received of this substance was a thin column, which, from its appearance, must have occupied a space from the top to the bottom of the coke in the coking furnace. An average sample was selected from this for examination, and the results obtained were as follows:—

"Density of coke 1055, water being 1000. The analysis in 100 parts,

Carbon,	86·91
Hydrogen,	1·32
Oxygen,	0·10
Nitrogen,	0·80
Sulphur,	1·94
Moisture,	1·28
Ash,	7·65
	100·00

"One pound of this coke is capable of evaporating from 212° Fah. 12·78 lbs. of water; and 1 lb., of reducing from the oxide of lead 31·35 lbs. of metallic lead.

"No. 3.—Llanguathog Merthyr.—This coal has a bright sparkling appearance, resembling to some extent (No. 1) Ramsay's coal; but it is rather more dense, and not so easily broken; when broken, however, the layers are not so thick, and between them no iron pyrites are visible, but thin plates of silicate of lime are occasionally noticed.

"Density of coal 1333; water 1000. The analysis in 100 parts,

Carbon,	89·16
Hydrogen,	4·06
Oxygen,	1·65
Nitrogon,	1·21
Sulphur,	1·39
Moisture,	0·67
Ash,	1·86
	100·00

"One pound of this coal is capable of evaporating from 212° Fah., 14·74 lbs. of water, and 1 lb. of reducing from the oxide of lead 34·74 lbs. of metallic lead.

"No. 4.—'Griff' Coal.—This is a coal of a dull appearance, dense and hard, with a concoidal fracture, different from either of the other two coals.

"Density of coal 1341; water 1000. The analysis in 100 parts,

Carbon,	66·21
Hydrogen,	4·09
Oxygen,	11·07
Nitrogen,	1·13
Sulphur,	1·01
Moisture,	9·23
Ash,	7·26
	100·00

"One pound of this coal is capable of evaporating from 212° Fah. 9·8 lbs. of water, and 1 lb. of reducing from the oxide of lead 25·14 lbs. of metallic lead.

"Table of Foregoing Results:—

	No. 1. Ramsay's Coking Coal.	No. 2. Coke from Ramsay's Coking Coal.	No. 3. Llanguathog Merthyr Coal.	No. 4. Griff Coal.
Density,	1·279	1·055	1·333	1·341
Carbon,	85·57	86·91	89·16	66·21
Hydrogen,	5·68	1·32	4·06	4·09
Oxygen,	3·07	0·10	1·65	11·07
Nitrogen,	1·48	0 80	1·21	1·13
Sulphur,	1·46	1·94	1·39	1·01
Moisture,	0·74	1·28	0·67	9·23
Ash,	2·00	7·65	1·86	7·26
	100·00	100·00	100·00	100·00
Pounds of water which 1 lb. of fuel would evaporate from 212° Fah.,	15·18	12·78	14·74	9·8
Pounds of lead reduced by 1 lb. of fuel.	34·99	31·35	34·74	25·14

"In glancing at the above table, the first thing that arrests the attention is the proportion of sulphur being greater in the coke than in the coal from which it was made, and by nearly half a per cent.

"It appears from my analysis that, although in coking coal there may be a notable loss, in the per centage of carbon, hydrogen, oxygen, and nitrogen, in the coke, yet the sulphur has not only not decreased, but has actually increased in the per centage. I find in the coking oven that not more than one-twelfth of the sulphur goes off from the coal, whilst the loss of the other gases is upwards of one-third of the whole.

"But portions of the coke may be found to contain a very much larger quantity of sulphur than I found in the above specimen, and if I had selected a piece from near the top of the column, instead of taking an average of the whole, I should have found very much more than I did.

"The pieces of coke delivered to me by your assistant, which he told me he had taken from the tender of an engine in going down to Southampton, on the 2d ultimo, gave, on an average, 5·62 per cent of sulphur, and some which I selected myself from the coke-heap at the Nine Elms station gave about 5 per cent.

"The next peculiarity to be noticed between the coke and the coal from which it is made is, in the amount of ash being very much higher in the former than in the latter; this is caused by an excess of iron and silica principally, and were it not for the increase of ash there would not be so very much difference in their heating power, &c. I can only account for this increase in these two substances from their being volatilized in the coking ovens, and entering into the crevices of the fuel from which the gases escape.

"It is common to find large quantities of a hair-like substance adhering to the coke, varying in color from a light grey to black; this is silica, with a trace of carbon and iron, and which has been in a state of volatilization till arrested by coming to a cooler part of the coking oven, where it has condensed, and is found as I have described it.

"No. 3.—Llanguathog Merthyr Coal,—You will observe, is a coal of a very superior quality, and is nearly equal to Ramsay's coking coal in heating power, and has a very little less per centage of sulphur; but No. 4, 'Griff' coal, though containing less sulphur than either, does not possess such heating power, which is partly owing to its containing a large per centage of water; this water is expelled when the coal is reduced to a fine powder, and submitted for some time to a temperature of 212° Fah. The moisture in the other specimens was determined in a similar manner.

"I may state that my experiments were repeated, and great care was bestowed to verify any results which appeared contrary to what should have been expected, such as the larger amount of ash in coke, in comparison to the coal from which it was made, and the larger amount of sulphur in coke than in coal, the general belief being that in the coking of coal most of the sulphur is driven off."

I will now proceed to give a detailed statement as to my mode of procedure to ascertain the quantity of fuel consumed per trip from the Waterloo Station, London, to Southampton and back again, inclusive of the quantity used in getting up steam in the morning, and whilst waiting at Southampton. I personally inspected the weighing of the fuel in the morning, and again at Southampton, and on the return of the engine to Nine Elms I took an account of the coal which remained on the tender, and I had the fire-box cleared out, the hot material cooled and riddled, and the worthless portion separated, and I allowed the value in good coal for the remainder.

I commenced my experimental trips with the coal engine "Ironsides," which had been constructed on Mr. Beattie's patented plans, for burning coal only, and heating the feed-water, and took the 10·15 A. M. mail train from Waterloo to Southampton, and arrived there at 1·5 P. M. We commenced the return journey at 3·0 P. M., and arrived at the Waterloo Station at 5·58 P. M., the engine having performed the trip in the most satisfactory manner, and without any appearance of smoke, except when the steam had to be got up in the morning, or the fires prepared for the return journey.

The result of that day's trip will be seen by referring to the tabu-

lated summary opposite November 15th, where the average consumption of fuel is shown as 16·71 lbs. of coal per mile, or when reduced to its coke value, equal to 11·14 lbs. per mile, with an average load of 12·2 carriages per mile, traveling at an average speed of 31·25 miles per hour.

I have said that the consumption of coal, when reduced to its coke value, was equal to 11·14 lbs. per mile; in explanation of my meaning, I beg to state experience has proved that, in order to make one ton of good coke suitable for locomotive engines, 1½ tons of the best coking coal is required, and with some kinds of coking coal, 1½ to 1¾ tons are necessary to produce one ton of coke. It will be evident then, that if the same load can be taken, at the same velocity and under the same circumstances in respect to weather, with equal weights of fuel, say with coal in engines fitted up with Mr. Beattie's patented contrivance, and with coke in the ordinary class of engines, a net saving is effected of one-third, or 33 per cent., in fuel alone, without taking into consideration the incidental saving consequent on the construction of coke ovens, the interest on capital, the cost of their maintenance, and the wages of workmen employed in the manufacture of coke.

From the tabulated summary it will be seen, that I worked the coal engine "Ironsides" for three days with little variation in respect to the quantity of fuel consumed, that little variation arising from the change in the weather. I then selected the coke-burning engine "Vesuvius," one of the ordinary class, and being nearest in dimensions and weight to the "Ironsides," and in good working order, and with it I took a similar train (10·15) to and from Southampton, burning coke only, and I adopted the same course of proceeding as on the former trips, but with a very different result as regards the consumption of fuel; for, on referring to the general summary, it will be seen that the average load was 12·1 carriages, the average speed 30·27 miles per hour, while the average consumption of fuel was 20·62 lbs. of coke per mile. On the following day I took the "Express" train with the same engine, but the results were substantially the same as on the previous day with the "mail" train.

Having tried the "Vesuvius," I decided upon taking another coke-burning engine (the "Frome,") which was a similar class engine to the "Vesuvius," in order to ascertain if there was any difference in the results of their working. On referring to the summary of the trip opposite November 22d, it will be seen that the consumption of fuel was remarkably near that of the "Vesuvius."

I then determined to test the capabilities of another coal-burning engine, the "Canute," and compare the results of its working the "Express" train with that of the "Vesuvius." The load was lighter, averaging 9·3 carriages, but the average speed attained was higher, being 36·76 miles per hour. The consumption of fuel was 16·71 lbs. of coal per mile, the coke value of which is 11·14 lbs. per mile against 20·62 lbs. per mile consumed by the "Vesuvius."

The experiments up to this period showed a decided advantage in the coal-burning engines, so far as regarded economy of fuel, &c., but

the results were not conclusive to my mind, inasmuch as the engines had not worked under precisely the same circumstances with respect to weather and uniformity of load and speed. I therefore obtained a sufficient number of carriages to form two trains of equal size and weight, and I had a quantity of materials weighed and placed in each of them equivalent to a load of passengers. The coal-burning engine "Canute," was attached to one of the trains, and the coke-burning engine "Vesuvius," to the other. The weight of the train, including engine and tender, drawn by "Canute," was 170 tons, 8cwt., and that drawn by "Vesuvius," 167 tons, 12 cwt.

The trains left London and Southampton within a few minutes of each other, so that there could be no difference between them in respect to weather, but lest either train should run heavier than the other from extra friction in the axle bearings, I took a second trip on the following day with the engines changed from one train to the other. I registered the particulars of each day's trip separately, but taking the average of the two days working, the difference in respect to consumption of fuel will be more readily seen.

	Average speed.	Average consumption of fuel in lbs. per mile.	Load.
"Canute,"	28.40	Coal, 20·36	19 carriages.
"Vesuvius,"	27·23	Coke, 24·37	19 "

Coal reduced to its coke value 13·57, which shows a clear saving of 10·80 lbs. per mile.

I subsequently tested the capabilities of the coal-burning engine "Canute" for making sufficient steam when drawing heavy loads, and as this engine was rather heavier than the coke-burning engine "Vesuvius," I obtained an additional number of carriages, and after they had been weighted, I had twenty-eight of them attached to the "Canute," and twenty-two to the "Vesuvius," making the total weight of the "Canute" train 235 tons 13 cwt., and that of the "Vesuvius" train 189 tons 6 cwt. I was very desirous of testing the capabilities of the coal engine "Canute" for drawing a heavy load up the incline from Southampton to Andover (a distance of 22 miles) without the aid of a pilot engine, and for that purpose I added about 20 tons extra weight to its train beyond its proportionate load.

Early in the morning of December 19th, 1855, we proceeded to Southampton with the two trains, but unfortunately the water pipe attached to the lower part of the boiler in the "Canute" engine gave way, and the leakage therefrom became so great soon after we left Southampton, that we were obliged to pump into the boiler an extra supply of water to compensate for the loss sustained. A reference to the registered account of the trip on that day will show that while the "Vesuvius" (coke) engine evaporated 7·13 lbs. of water by 1 lb. of fuel, the "Canute" (coal) engine evaporated 9·05 lbs. of water by 1 lb. of fuel. The amount of water, therefore, which passed from the tender of the "Canute" engine was greater by 1·92 or nearly 2 lbs. of water per 1 lb. of fuel, than that from the tender of the "Vesuvius," but notwith-

standing that mishap, the "Canute" generated sufficient steam to draw the 28 loaded carriages up the incline without any aid whatever.

The firing, from the same cause, was increased, but the result on the day's work of the two engines was still in favor of the coal-burning engine, as will be seen from the summary, and it is worthy of remark that when the coal is reduced to its coke value, the result is 10·30 lbs. per mile in favor of the coal-burning engine, "Canute."

I have shown that the saving effected by the coal-burning engines with the ordinary trains, was equal on the average to 8·56 lbs. of coke per mile, or 10·80 lbs. of coke per mile when each engine worked under the same circumstances as to weather, &c., with equal loads; now, if the former quantity, viz., 8·56 lbs. per mile be taken, the saving is equal to 1·348 lbs. on each trip, or at the rate of 187¾ tons per engine per annum, at six days work in each week; but if the latter quantity, viz., 10·80 lbs. per mile be taken, the saving is equal to 1·721 lbs. at each trip, or 239½ tons per engine per annum.

The consumption of coke by the coke-burning engine "Vesuvius" during one of the trips referred to, was 29½ cwt., which, at 31s. 6d. per ton, was equal to £2 6s. 6d., whereas, the consumption of the coal-burning engine "Ironsides," during another of the trips, was 24¾ cwt., which, at 19 s. per ton, was equal to £1 3s. 6d., giving a clear saving on the latter per trip, of £1 3s. In my report to the Directors of the London and South Western Railway Company, I stated that if they had seventy engines in steam per day, and each of them was fitted up for burning coal, and all worked under similar circumstances to the "Ironsides," there would be a daily saving to the Company of £80 10s., or £483 per week of six days, or £25,116 per annum.

From the result of these interesting and important experiments, I trust I have succeeded in demonstrating the truth of the assertions I made at the meeting to which I have referred, namely, that coal can be used more economically in locomotive engines than coke; that by the use of coal sufficient steam can be generated to supply locomotive engines when working at high velocities and when drawing heavy loads; and, in support of my assertion relating to the capability of coal-burning engines, built in accordance with Mr. Beattie's patent, consuming their own smoke, I have to observe, that a goodly number of them are at work on different lines of railway, and testimonials of their efficiency have very frequently been given.

(To be Continued.)

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*Association for the Prevention of Steam Boiler Explosions.**

At the usual monthly meeting of the committee of management, held on Wednesday, at the office of the secretary, Mr. Henry Whitworth, Corporation street, Manchester, the chief inspector, Mr. H. W. Harman, presented his monthly report, from which the following are extracts:—The following is a statement of our position as regards the number of works and boilers under the inspection of the association,

* From the Lond. Mining Journal, No. 1231.

for the month ending the 18th March, 1859:—530 mills and other works, and 1466 boilers, being an increase since the 22d ult., of 50 mills and other works, and 139 boilers. We have also made 230 visits and examined 667 boilers and 500 engines. Of these, two visits have been special, and one boiler specially examined, also 11 internally, and 27 thoroughly examined: 84 diagrams have been taken from 49 cylinders; 8 diagrams from 4 cylinders have been special. The usual copies, with calculations of power, consumption of fuel, and general recommendations, have been forwarded to proprietors. The number of boilers found to be defective are as under: corrosion, 20, of which 6 were dangerous; fractures, 3; safety-valves overweighted and otherwise out of order, 31; pressure gauges out of order, 20; water gauges out of order, 17; feed apparatus out of order, 5; blow-off cocks out of order, 9, of which 1 was dangerous; deficiency of water, 2; total 107. 10 boilers were without glass gauges; 28 boilers were without blow-off cocks; 3 boilers were without pressure-gauges; 7 safety valves had the spindles passed through stuffing boxes.

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*Stephenson and Alderson.**

I have waited to see whether any one would point out the fallacy of Stephenson's statement (*Athen.* No. 1633, p. 217,) that either iron or ice will bear a weight passing over it at a greater velocity, which it could not bear if it went slower; and that "when it goes quick, the weight in a manner ceases." The very reverse of this is the truth, as was clearly established by the "Iron Commission," which was appointed a few years since, to inquire into the causes of the breaking down of the iron bridge over the Dee. And the principle so established is now universally acted upon throughout our railways; the speed of the trains, upon approaching bridges of any considerable length, whether of iron or wood, is usually slackened to 8, 6, or even 4 miles an hour, according to circumstances; and the same rule, viz., of going slow, and not of going quick, is always observed in passing over an unsound part of an embankment. I was myself present at some very interesting experiments made by this Commission at the iron bridge of the South-Eastern Railway, near Epsom, in the presence of Lord Wrottesley, Sir W. Cubitt, the Astronomer Royal, and several others. Prof. Willis had contrived a very ingenious apparatus, which, fixed to the centre of one of the iron girders, measured and registered the deflection of the bridge at the passing over of any weight. An engine with a heavily-laden tender was then passed over the bridge at speeds varying from 10 to 60 miles an hour, and it was found that the greater the speed the greater was the deflection of the girder. K. A. W.

* From the London Athenæum, Feb. 26, 1859.

AMERICAN PATENTS.

List of American Patents which issued from May 17 to June 7, 1859, (inclusive,) with Exemplifications.

MAY 17.

181. Cotton Pressers; E. H. Adams, Talladega, Alabama.

Claim—The combination and arrangement of guide rod, toggle levers, connecting rod, lever, and rack lever, all operating in the manner set forth.

182. Surgical Splints; David Ahl, Newville, Pennsylvania.

Claim—A splint, made of the ingredients, and in the manner set forth.

183. Stencil Brush; V. R. Allen, St. Louis, Missouri.

Claim—The mode of making the handle of the brush in two parts, and fastening the two parts by means of a screw, turned on the wedge (which I term a wedge-screw), which is driven through the bristles in the iron band thereby wedging the bristles in the band, and enabling the main handle to entirely cover the ends of the bristles and band, which prevents the handle and bristles, when in use, from working through the iron band holding the brush together.

184. Cut-off Gear of Steam Engines; E. R. Arnold, Providence, Rhode Island.

Claim—1st, The combination of an adjustable cam or sector, or its equivalent, located on the rock shaft; a stop-block, or its equivalent, and an arm, or its equivalent, attached to the devices which lift the valve—the three so combined operating to regulate the cut-off of the steam, in its passage into the engine, at any desired point of the stroke. 2d, The same combination above specified, for the purpose of working the exhaust valves of a steam engine, by means of the same rock shaft and eccentric motion with which the steam valves are operated.

185. Variable Exhaust of Locomotive Engines; Wm. S. G. Baker, Chicago, Illinois.

Claim—The plug, arranged in combination with the shell, and with the exhaust pipes of a double cylinder steam engine, in such a manner that the exhaust of each cylinder can be varied while both are separate from each other.

[This invention consists in arranging over the exhaust pipe a rotary cylindrical plug, with different sized openings, which are brought to correspond with the openings in the exhaust pipe and with the openings of the pipes leading therefrom to the chimney by means of gear wheels, which are easily operated from the engineer's stand, and the whole is so arranged that the steam from the two cylinders is kept separate until it reaches the chimney, and that the opening of the exhaust pipe for each cylinder is raised separately.]

186. Sewing Machines; Abraham Bartholf, City of New York.

Claim—Applying the said lever to work on a fixed fulcrum, in combination with a friction clamp, which, though it permits the said lever to be moved by and with the needle arm or needle carrier, during a portion of the movement of the latter in either direction, for the purpose of drawing back the thread through the cloth, and completing the stitch, and letting it slack again to form the loop of a succeeding stitch, holds the said lever in a positively stationary condition during the first part of the movement of the said arm or carrier in either direction, and so prevents the thread getting slack till the needle has entered the cloth, and prevents its being drawn up through the cloth till the heel of the shuttle has arrived at the loop. And in combination with the thread-controlling lever, operated by the needle arm or needle carrier, I claim the stationary eye made adjustable relatively to the said lever.

187. Seeding Machines; E. O. Baxter, Foreston, Illinois.

Claim—1st, The clearers formed of the bars, i i, placed on the seed tubes, connected with the bar, I, and operated through the medium of the lever, J, or its equivalent. 2d, The frame fitted to the axle, in connexion with the cams interposed between the axle and the frame, so as to raise the frame when desired, to throw the seed-distributing device out of gear with the driving wheel. 3d, The arrangement of the frame, lever, N, connected with the frame by the rod, and the upright on the draft-pole, for the purpose of regulating the depth of the furrows.

188. Artificial Legs; Douglas Bly, Rochester, New York.

Claim—1st, Curving or deflecting the jointed extremities of the bars, so as to bring their axes of motion back of their line of direction. 2d, The cord and spring acting upon the parts, D and L, in the manner set forth. 3d, I am aware that metallic springs have been employed to similate the functions of the natural muscles; but experience has proved their inadequacy, both as respects the results obtained and their durability. I am also aware that india rubber or elastic cords have been used for the same purpose, and with no better results, and these I do not claim—but I claim the combination of the non-elastic tendon with the india rubber spring, in such a manner that the required effect is derived from the compression and expansion of the material, and not from its elongation and contraction.

189. Sewing Machines; A. H. Boyd, Saco, Maine.

Claim—The employment of lever, I, a shoe and shoe-shaft, spring, plate, and sliding bar, with an under feed-plate, the shoe and the feed-plate having an intermittent, direct, horizontal, reciprocating motion, and the shoe having an intermitting, direct, vertical, reciprocating motion.

190. Apparatus for Cooling Beer; James Boyle, Roxbury, Massachusetts.

Claim—The combination with two or more vessels containing a series of tubes inserted in diaphragm plates, so arranged as to allow communication from the upper part of each vessel to the lower part thereof, and vice-versa, by means of and through the said tubes or pipes, so arranged on either side of the diaphragm as to connect the said vessels alternately at the top and bottom thereof; and of a pump or any suitable device for forcing beer, or any other liquid to be cooled down, through one set of tubes and up the other, while a supply of cold water surrounding said tubes is forced in a direction opposite to that of the liquid contained therein.

191. Drill Stock; M. S. Brooks, Chester, Connecticut.

Claim—The arrangement and combination with a spiral or screw-shaped shaft of a tube, ratchet, and stop within the socket, as described.

192. PLUG FOR BLASTING ROCKS; J. D. Buckley and S. F. Mosher, Schaghticoke, New York.

Claim—The combination of the tapered screw with the expanding metallic plug, having ledges, or other equivalents, to penetrate the rock, and provided with an aperture for the fuse.

193. MACHINERY FOR HARDENING HAT BODIES; George E. Cowperthwaite, Danbury, Connecticut.

Claim—The method of hardening hat bodies by means of a cradle, sustained in an inclined position, and having a tremulous movement. Also, the method of subjecting hat bodies to greater or less pressure during hardening, by inclining the cradle of the hardening machine to a greater or less extent.

194. ROCKING TOY; J. A. Crandall, City of New York.

Claim—The flat-wound springs, pole or bar, elastic string, pin or thumb-screw, or their equivalent, in combination with the box and frame.

195. MACHINE FOR UPSETTING TIRE; C. L. Crowell and Robert Smith, Peoria, Illinois.

Claim—The combination of the lever and the intermediate slide, for the purpose of giving movement to the sliding jaw.

196. DRAWING HEADS FOR SPINNING MACHINES; James E. Crowell, Chelsea, Massachusetts.

Claim—So constructing and gearing the two pairs of drawing rollers, that each pair will draw and release the sliver or roving, and so allow the twist to pass and run back to the first rollers.

197. SOAP; William Dawes, Washington County, Tennessee.

Claim—The use of the ingredients, when combined in the proportions set forth.

198. TUYERE; George W. Dean, Glenn's Falls, New York.

Claim—The adjustable rotating chambered cylinder, arranged with the slot in the bed-plate, and relatively with the blast pipe, to operate as set forth.

199. CULTIVATORS; Oliver H. Dennis, Altona, Illinois.

Claim—The arrangement and combination of the hinged handles, hinged side beams, B B, and connecting bars, in relation to the central beam, A, for the purpose specified.

200. STRAW CUTTERS; J. B. Drake, Goshen, Indiana.

Claim—The arrangement of the hinged, forked, feeding pawl frame, feeding and stop pawls, centrally arranged ratchet wheel, spiked feed roller, and rising and falling knife frame.

201. LAMPS; John L. Drake, Cincinnati, Ohio.

Claim—1st, A wick tube for containing two or more flat wicks, one at least of which wicks is a conductor, said tube having a double chamber, brace, and opening, as stated, so that the burning wick may receive the oil from the conductor, and still be free to move upon or against it, as it is raised or lowered, to regulate the burning. 2d, In combination with a slotted and perforated dome, and a flat wick for burning heavy oils, an auxiliary flat wick and wick tube.

202. APPARATUS FOR EVAPORATING SACCHARINE JUICES; Daniel I. Durfey, Croton, Ohio.

Claim—1st, A descending series of evaporating pans, each having a well or depression on the side next its immediate successor in the range, closable by sluices. 2d, The arrangement of the sluices alternately on the right and left of the range, when used in the described combination with the wells or depressions referred to. 3d, The strainer, in the described combination with the clarifier, operating in the manner set forth.

203. WATER INDICATOR FOR STEAM BOILERS; John L. Frisbie, Cincinnati, Ohio.

Claim—1st, The described combination and arrangement of the box, adjustable pipe, valve, sleeve, and sector, operating in connexion with the float arm, for the purpose of varying the point of alarm from the outside of the boiler. 2d, The cogged sector provided with a segmental slot, in combination with the sliding sleeve, float arm, and bolt, to enable the application of the alarm to any part of the boiler.

204. NUT CRACKER; Russel Frisbie, Middletown, Connecticut.

Claim—The nut cracker, substantially as described.

205. WATER-WHEELS; Omri C. and Jarvis O. Ford, Collinsville, Connecticut.

Claim—The application of the reversed curved buckets or guides, to form a reversed action centrepetal and centre vent turbine water-wheel, in combination with the inner and outer cut-off.

206. STRAW CUTTERS; A. W. Fox, Athens, Pennsylvania.

Claim—1st, The arrangement of the wheels, or their equivalent, in connexion with the crank, connecting rod, sliding frame, and shafts, by which I obtain an accelerated upward and retarded downward motion to the knife of a straw cutter. 2d, The combination of the sliding frame, with the knife sliding in the said frame, by means of the action of the angular slot and roller, or their equivalent, by which combination of parts a drawing cut is given to the knife, without interfering with the attachment and operation of the connecting rod, communicating motion from a shaft placed crosswise to the machine.

207. ARRANGEMENT OF KEY-BOARD FOR PIANOS, &c.; Alfred Gould and Cyrus Marsh, Seneca Falls, New York.

Claim—The arrangement of two, three, or more ranges of keys of the key-board, in the manner and in relation to each other, substantially as specified.

208. SEWING MACHINES; Joshua Gray, Medford, Massachusetts.

Claim—1st, The combination of the reciprocating bar with its side inclines and upper incline, with the bar, stop, and adjustable stop, arranged as described. 2d, In combination with the slide bar which operates the feeder, the bent lever, and universally adjustable cam.

209. WEIGHING SCALES; Wm. D. Guseman, Morgantown, Virginia.

Claim—A pendulum drum or roller, which has, in addition to a rolling motion, a traveling movement. Also, in combination with a rolling and traveling drum or roller, and an index, a traveling vernier or dial. Also, the combination of the horizontal levers of a platform scale with the pendulum drums and bands.

210. MACHINE FOR ROASTING COFFEE; Josiah D. Harrington, Rochester, New York.

Claim—1st, The construction and arrangement of the divided handle, whereby the crank not only serves to hold the two halves of the ball together, while rotating, but also to lift up one-half of the ball when moved into the position shown. 2d, My method of uniting the two halves of a coffee-roaster, by means of the hinge formed of the curved jaw attached to one-half of the ball, and passing into a slot in the second jaw, said slot having the pin beneath which the curved jaw passes.

211. Mode of Applying Lever Power; **Elijah Harris**, Princeton, Illinois.

Claim—The use of a weight, a single or double lever, axle, and pivots, acting in combination with the circular plate, ratchet-clicks, and ratchet wheel, in applying lever power to machinery.

212. Cotton Press; **Joseph Hawthorn**, Thomas Co., Georgia.

Claim—The combination of the screw, the tap-block, and the levers, with the packing cases and their followers.

213. Sewing Machines; **Albert H. Hook**, City of New York.

Claim—The combination of the cam, lever, and spring, arranged as set forth.

214. Cooking Stoves; **Sherman S. Jewett**, Buffalo, New York.

Claim—The bricks, when constructed, arranged, and supported within the stove, for the purposes of an oven, as described.

215. Machine for Manufacturing Picket Fencing; **Wm. W. Johnson**, Clarksburgh, Virginia.

Claim—1st, Operating a series of twisters by means of pulleys and cords, arranged so as to give a twist and reverse twist to the wire, in combination with vibrating fingers, hollow shafts, and tension plates, or their equivalents. 2d, The segmental roller, constructed of the pieces, r r′ r″, for the purposes explained.

216. Adjustable Canopy for Railroad Cars; **Isaac E. Jones**, Cincinnati, Ohio.

Claim—The combination of springs, covers, and hinges, arranged in the manner set forth.

217. Centrifugal Gun; **Wm. Joslin**, Cleveland, Ohio.

Claim—1st, Arranging the barrel upon the same shaft with cog-wheel, which is secured near the periphery of the plate, and revolving the barrel around the wheel. 2d, The combination of the bevel and spurr gear wheels with the plate and barrel. 3d, The arrangement of the slide with the barrel and bevel table, for the purpose of elevating the balls to the barrel. 4th, The arrangement of the revolving hopper, bottom plate, and cylinder, for the purpose of conveying the balls down to the barrel.

218. Pumps; **Albert B. Keeley** and **James S. Beck**, Philadelphia, Pennsylvania.

Claim—The combination of a solid or valveless oscillating piston with the peculiar shaped piston chamber, and with the upper and lower valves.

219. Breast Plate and Perspiration Shields; **Henry C. Lester**, Brooklyn, New York.

Claim—The combination of the arm-pit shields or protectors and breast pads, substantially as described.

220. Railroad Frogs; **David D. Lewis**, Tamaqua, Pennsylvania.

Claim—The steel point dovetailed to the body of the frog, in combination with the tread-plate and the block, when the said tread-plate overlaps and is riveted to the said point, and when the block is of such a tapering or wedge-shaped form that, during the process of riveting it and the tread-plate to the body of the frog, the said block may serve the purpose of driving the point tight up into its socket.

221. Ventilating Hats; **Arthur Maginnis**, Philadelphia, Pennsylvania.

Claim—The combination of the perforated hat body, the perforated sweat leather, and the intervening corrugated band, when said band is provided with corrugation upon its two sides, and made plain and smooth on its rear and front.

222. Filterer and Purifier; **Robert A. Maingay**, Pottsville, Pennsylvania.

Claim—1st, The combination of the lime water hopper, agitator, turbine, and hogshead. 2d, The combination of the alkali keg, hogsheads, and turbine. 3d, The arrangement and combination of the purifying and filtering hogsheads, filtering tank, turbines, purifier, and alkali kegs or hoppers.

[The mine water of coal regions is found, by analysis, to be strongly impregnated with carbonic acid, sulphuric acid, large quantities of alum, and sulphate of iron. These properties, as may be well known, render it very destructive to steam boilers and other apparatuses used about mines. The object of this invention is to deprive the water of these destructive properties, and at the same time filter it so that it will be useful for mechanical and domestic purposes. The nature of the improvement consists in a peculiar arrangement of a series of purifying and filtering hogsheads, a large filtering tank or reservoir, a series of purifying kegs or hoppers, and a series of turbines.]

223. Anti-friction Support for the Backs of Rudders; **Albert H. Manchester**, Providence, Rhode Island.

Claim—Supporting the rudder from behind by means of a bucker or bruce rising from the deck, or attached above it, having rollers in its face, constructed as described.

224. Gas Retorts; **Alfred Marsh**, Detroit, Michigan.

Claim—The employment of the secondary lid, for the purposes set forth, when the same is arranged and connected with the feed pipe.

225. Composition for Emery Sticks and Wheels; **Thomas J. Mayall**, Roxbury, Massachusetts.

Claim—The composition for the manufacture of emery wheels, sticks, and tools, of more or less flexible nature, formed of gutta-percha or india rubber, and sulphur, emery, and olive oil.

226. Machine for Sawing Beveled Surfaces; **John McDiarmid**, Brooklyn, New York.

Claim—The employment of the oscillating frame, in combination with the centre wheel, central flanch, and saw or cutters, constructed in the manner described.

227. Metallic Seals; **Charles A. McEvoy**, Richmond, Virginia.

Claim—The use of a paper label, or its equivalent, in combination with a metallic seal.

228. Seeding Machines; **Charles Messenger**, Warren, Ohio.

Claim—The lever, b, arm, c, levers, e, and spring, in combination with a combined seeding machine and ground roller. Also, the studs, rods, and shaft, in combination with the cams, when used in connexion with the seeding machine and ground roller combined.

229. Screw Excavator; **Richard Montgomery**, City of New York.

Claim—1st, Making the cylinder, which encloses the screw, in a conical form, for the purpose of rendering the ascent and discharge of the earth more free and perfect. 2d, Supporting the cylinder and screw by means of the hinged frame. 3d, Driving the cylinder and screws by means of the gearing, arranged as described. 4th, Supporting and adjusting the front of the excavator by means of the friction ring and chain or rope. 5th, The curved swinging standard or derrick for elevating the front end of the excavator without

unfastening the chain, when desired. 6th, The combination of the cylinder and screw with the swinging frame, derrick, and carriage.

230. Extension Ladder; Joel Moulton, Boston, Massachusetts.

Claim—The improved extension ladder hose carrier, constructed with a series of single ladder bars, connected together and provided with pins or handles, and having not only an extension line and sheaves connected with and arranged in them (the said bars), as explained, but a supporting platform and guide braces, arranged at the upper part of the upper bar. Also, the combination and arrangement of the water conduit or hose pipe director and its guiding lines with the extension ladder.

231. Metal Drills; Jacob Murphy, Half Moon, Pennsylvania.

Claim—The shoulders on the drill, in combination with the braces and pin upon the sliding frame.

232. Machine for Rolling and Measuring Cotton Bagging; Thomas H. Murphy, New Orleans, Louisiana.

Claim—The combination for simultaneously rolling and measuring bagging, consisting of an adjustable guide bar, sliding shaft, fitting into driver, the windlass and cord, adjustable pressure roller, carrying cam, lever, indicating wheel, arm, pawl, and spring.

233. Machines for Husking Corn; Jacob Naeher, North Orange, New Jersey.

Claim—The reciprocating troughs, one or more, provided with pincers, in connexion with the toothed plates or stripping combs, and with or without the retaining plate.

234. Metallic Frames for Window Blinds; Charles Neer, Albany, New York.

Claim—Constructing frames for blinds of sheet metal, bent in a U form, and connected together as specified. Also, the bent or folded strips, provided with holes receiving the ends or tenons of the slats.

235. Mop Handle; H. and J. S. B. Norton, Farmington, Maine.

Claim—Attaching the mop cloth or yarn to the handle and to a slide fitted on the handle.

236. Manufacture of Bricks; Nelson Parmeter, Gardner, Massachusetts.

Claim—A fire-proof brick or lining, composed of the above named ingredients, in the proportions set forth.

237. Signal Door Bolt; Charles Page, West Meriden, Connecticut.

Claim—Passing the pin which moves the bolt through the door, and permanently fixing to the projecting extremity thereof a segmental plate, so as to overlay the fixed symbol plate, and communicate the desired intelligence.

238. Machine for Planing and Shaving Ice; H. D J. Pratt, Washington City, D. C.

Claim—The machine or implement for cutting or reducing ice to small particles, as described, the same consisting of the arrangement in a hopper of suitable size and shape of rotating cutters, with or without a presser.

239. Cultivators; Asa Preston, Unionville, Ohio.

Claim—The construction of a combined plough cultivator, having the several parts so arranged that they can be easily attached or detached when said plough has the hinged wings, mould-board, bars, and blades, arranged as set forth.

240. Water-wheels; Reuben Rich, Albion, New York.

Claim—Constructing the pen-stock, dadoed joints, and bolts, in combination with gates, and centre scroll plate, and wheel, constructed in the manner specified.

241. Water-wheels; Sylvanus Richardson, Jericho, Vermont.

Claim—The float with hinges, as shown at point marked a, and the spiral or curved form of the lower part of the float, as shown at points marked b, combined with the extension downwards of the case below the scroll case, and with draft tube.

242. Washing Machine; John R. Rogers, Sacramento, Wisconsin.

Claim—The combination in cylinder of the diagonal slats with the two heads of the cylinder, when said heads are provided with holes of such a shape and form that they will collect and force the water in, and empty it at alternate ends of the cylinder, as the direction of its revolutions are changed.

243. Water-wheel; Timothy Rose, Cortlandtville, New York.

Claim—Forming the buckets of four parts, arranged or disposed relatively with each other, the hub, and annular plate, and with a scroll, specifically as described.

[This is an improvement on that class of water-wheels which rotate in a horizontal plane, and are acted upon and propelled both by the impacting and re-acting force of the water as it passes through the wheel.]

244. Cast Iron Grinding Mills; John Russell, Troy, New York.

Claim—1st, The combination of the breaker and internally armed hopper with the upper grinder and lower grinder, for the purpose of feeding into the mill and grinding large substances, such as corn on the cob. 2d, Making the armed portion of the hopper of separate rings provided with internal projections, and arranged and secured together in the mill, as set forth. 3d, Making the lower grinder of separate toothed rings, arranged and secured together upon the supporting plate. 4th, Making the upper grinder of separate toothed rings, arranged and secured together in and to the supporting plate.

245. Seeding Machines; Thomas Short, Danville, Illinois.

Claim—The swinging frame, when provided with a seed-distributing device actuated by a wheel and cutting furrow shares, and fitted within a mounted frame.

246. Refining Iron in the Hearth of a Blast Furnace; Christian Shunk, Canton, Ohio.

Claim—The employment of an auxiliary tuyere pipe within the hearth of the common blast furnace, when charged with molten iron, at such an angle as that the blast of air entering the iron may strike the circular wall of the hearth, as nearly as possible, at a tangent to its circumference, so as to cause the blast of air to pass round in the metal, giving the whole mass in the hearth a spiral motion immediately before the tapping of the furnace for the manufacture of pig iron from the ore.

247. Sewing Machines; James C. Spencer, Phelps, New York.

Claim—The construction of a feeder and needle bar in one piece or connected together, and the combination of the eccentric and pin with the needle bar, by means of the slot.

248. HARVESTING MACHINES; Wm. S. Stetson, Baltimore, Maryland.

Claim—1st, Connecting the finger bar to the frame of the machine by means of the saddle and its support. 2d, In combination with the saddle, the swiveling guide and swiveling lever. 3d, Throwing the cutters in and out of gear by means of a shifting bar.

249. HARVESTING MACHINES; W. S. Stetson and R. F. Maynard, Baltimore, Maryland.

Claim—1st, The double hinge joint at the end of the finger bar, consisting of the hinge, shaft, collar, and brace. 2d, The compound connecting rod. 3d, So constructing or forming the upper part of the obtuse angle iron tooth bar and the base of the finger or tooth, that said base shall bear upon two plain faces of the said angle iron, in the manner set forth.

250. FOOT POWER MACHINE; Frederick S. Stoddard, Litchfield, Connecticut.

Claim—1st, A two-throw crank, operated by one pitman, in combination with a lever and spring, or their equivalents. 2d, The mode of attaching the spring to the foot-piece to operate on the pitman crank, in connexion with the set-screws for adjusting and reversing the motion.

251. POTATO PLANTER; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The combination of the compound cam, hooked lever, and sliding crosshead, with cutter attached. 2d, Arranging the plough-shares and covering shares on parallel rock shafts, so that a lateral and vertical adjustment can be given to the same.

252. STOP-GAUGE FOR WEATHER BOARDING, &c.; Worden E. Stoddard, Horicon, New York.

Claim—The use of the bar forming a stop or support for boards and mouldings, and the knob, the spur, and the adjustable slide.

253. PADDLE-WHEEL; John Thompson and M. L. Doty, Carlton, Iowa.

Claim—The buckets of a paddle-wheel, arranged in combination with the segments, the weighted pinions, and the dogs, or their equivalents. And in combination with the above named parts, the arrangement of the spurs, or their equivalents, for the purpose of retaining the buckets in the proper position while the wheel is backing.

254. PROPELLER; Charles R. M. Wall, City of New York.

Claim—1st, An apron, arranged in such relation to a wheel that it operates to propel a vessel. 2d, The arrangement of the rollers in combination with the apron, whereby the wheel is made to work at any dip. 3d, The springs or their equivalent, arranged in combination with the rollers and with the apron, for the purpose of regulating the strain on the apron.

255. NEEDLE-CASE AND INDEX; Calvin D. Wheeler, City of New York.

Claim—A needle-case and index combined for sewing machines, whereby the appropriate sizes of the thread and needles to properly work together is always determined.

256. SEEDING CULTIVATOR; Nicholas Whitehall, Newtown, Indiana.

Claim—The combination of the stirrups with the notched handles, eye bolts, and hooks, by which I am enabled to raise and secure the plough at any desirable height.

257. CEMENTS FOR ROOFING; J. Carpenter Worth, Little Britain Township, Lancaster Co., Pennsylvania.

Claim—The composition for roofing made up in the manner and of the ingredients proportioned and mixed, as set forth.

258. PUMP; John H. Young, St. Louis, Missouri.

Claim—Dividing the pump cylinder into two chambers by the division valve seat plate, with its valves opening upwards, and uniting them by the water way, as described. Also, the puppet valves, connected to, and operating with, the buckets in the two chambers, so that, whilst they move with said buckets, they shall have action independent of them. Also, in combination with the hollow piston and stem passing through it, the causing of the upper valve to close upwards against its bucket.

259. RAILROAD SWITCH; Jacob Youngman, Sunbury, Pennsylvania.

Claim—The arrangement of two guards, so that a space exists between them at the point where the cars take an oblique direction to the switch rails, in order to run upon the lower portion of the main track on a frog plate which has stationary frogs and a rail arranged on it.

260. LOCK; Orson Billings, La Grange, Ohio, Assignor to self and Morris Traver, Clinton Hollow, New York.

Claim—The combination of the guards or plates arranged relatively with each other and the bolt, to operate as set forth. Also, the spring tops when applied to the guard or plate, and the latter is used in connexion with its fellow guards, for the purpose described.

261. HAND-PLANING MACHINE; Tyrannus B. Butterfield, Indianapolis, Assignor to Abijah Taylor and R. Stevenson, Morgan Co., Indiana.

Claim—The combination and arrangement of the frame, knife, feed roller, spring, and screw.

262. WINDOW SASH SUPPORTER; Sumner Cooper, Windsor, Connecticut, Assignor to self, Thomas Denham, and Joseph W. Briggs, Cleveland, Ohio.

Claim—The combination and employment of the spring pinion pulley, with the rack or perforated plate, tube, or box, pin, key, and latch.

263. CONNECTING TOGETHER THE BRACES OF TRUSS BRIDGES; L. E. Truesdell, Warren, Massachusetts.

Claim—The method described of constructing and interlocking the diagonal braces.

264. FEEDING DEVICE FOR PLANING MACHINES; C. B. Cottrell, Assignor to self and Nathan Babcock, Westerly, Rhode Island.

Claim—The combination of the anti-friction and feed rollers, applied to the class of planing machines described, and driven from one and the same shaft by gearing, arranged to admit of a separate lateral adjustment of each.

265. MACHINE FOR SHAVING STAVES FROM THE BOLT; Harry H. Evarts, Assignor to self and P. E. Merrihew, Chicago, Illinois.

Claim—1st, The employment or use of the reciprocating saws in connexion with the swinging bolt frames, operated by the wiper wheels, or their equivalents. 2d, The employment or use of the segment racks, connected by the pinions with the right and left screw rods, having jaws placed thereon, for the purpose of dogging and undogging the bolts at the proper time.

266. VALVES FOR DRY GAS METRES; Henry Howson, Assignor to A. Harris and J. W. Harris, Philadelphia, Pennsylvania.

Claim—1st, A pin, or its equivalent, fitted loosely to the valve, and intervening between the valve and the driver. 2d, Constructing the driver in the form of an inverted cup, with driving pins in the inside, said cup being so arranged in respect to the annular flanch of the valve, as to serve the double purpose of maintaining the latter in its proper position, and of preventing the access of tar to the driving pins.

267. SEWING MACHINES; Warren Millar, Assignor to self and John Nutt, Chicago, Illinois.

Claim—1st, The hook, as described, in combination with an eye-pointed needle and the spool case. 2d, The combination of the flanch and space, or their equivalents, of the spool case. 3d, The sliding supports, or equivalents therefor. 4th, Imparting to the spool case the tripping or rocking motion, to receive the loop of needle thread from the hook, or its equivalent, in the manner described.

268. CORN AND COB MILLS; Wm. Sailor, Assignor to self, William S. Boyer, and H. K. Boyer, Philadelphia, Pennsylvania.

Claim—1st, The plates with their saw teeth, when the said plates are secured obliquely on the spindle and adjacent to the burr, and when both the burr and plates are arranged in respect to the shell, as set forth. 2d, Forming the burr in three or more separate pieces, adapted and secured to each other and to the spindle, as specified.

269. VINEGAR CRUET OR BOTTLE; George W. and George H. Simmons, Bennington, Assignors to selves and Norman Millington, Shaftsbury, Vermont.

Claim—A bottle, cruet, or other similar vessel, for containing liquids for table, culinary, or household purposes, provided with the tubes, A and B, made and fitted to them in the manner described.

MAY 24.

270. SHOE FOR GRAIN SEPARATORS; Hiram Aldridge, Michigan City, Indiana.

Claim—The endless incline elevator belt with its lags or cross slats, in combination with the incline sieve or board and incline extension board.

271. BEDSTEAD FASTENING; G. W. Baker, Cochranton, Pennsylvania.

Claim—The box, the hook, and the rack, when combined in the manner described.

272. SMUT MACHINES; E. Barnhart, Shippensburg, Pennsylvania.

Claim—The disc arranged with the fluted shell and with the wings, to operate in combination with the fluted cylinder, which is provided with a spout.

273. SURFACE CONDENSERS; Daniel Barnum, City of New York.

Claim—The method of making yielding joints between the tubes and tube sheets in the condensing water compartments of surface condensers, and of thus compensating the expansions and contractions in the tubes, by the means of leaving a portion of india rubber, or other elastic packing, immediately surrounding each tube free, so that its elasticity can yield longitudinally with the tubes and compensate for their varying lengths, without causing the packing to slip on the metal. Also, the combination of a relief valve with yielding joints (without followers) in the condensing water compartments of surface condensers, for the purpose of preventing the blowing out of the packing, and thus preserving the joints.

274. HEMMING GUIDES FOR SEWING MACHINES; Daniel Barnum, Jersey City, New Jersey, and S. G. Tyler, Quincy, Illinois.

Claim—The manner of arranging and constructing a hollow conical U-shaped tube and slot, in combination with a horizontally acting spring plate, or its equivalent, bearing against the slot, and tending to press the edge of the flexible material, when the same is placed within the slot into the tube, and against the lower side of the concave surface thereof, for the purpose of aiding the hand in turning the hem on the underside, and leaving the fair stitch upon the upper or right side of the garment.

275. CULTIVATORS; J. W. and Leonard Batson, Clarksville, Maryland.

Claim—The arrangement of the reversible concave shovel point, H, reversible shovel point, F, and the cutter, with beam and standards, in the manner described.

276. RIG FOR VESSELS; Thomas Bell, City of New York.

Claim—The arrangement and combination of the mast, spar, and revolving forked mast bench, as described.

[The mast of a vessel and its spar or spars are combined in such a manner that the mast turns with the spar or spars, and all the sail spread on the mast is caused to have a similar lifting action on the vessel; the mast is also attached to the vessel in a novel manner.]

277. SPRING BED BOTTOM; Ezra R. Benton, Cleveland, Ohio.

Claim—The construction of a bed bottom or spring couch, consisting of a series of double springs, the longitudinal pieces, and the transverse slats, either with or without the flexible band, arranged as set forth.

278. CARDING ENGINES; John Boyd, Philadelphia, Pennsylvania.

Claim—The combination of the rollers and scrapers, for stripping the ordinary doffing cylinder of a carding engine, as described.

279. HARVESTING MACHINES; C. R. Brinkerhoff, Batavia, New York.

Claim—1st, The combination of the crank, operated by the main shaft, with the rake and sweep post, to which it is attached, and the eighth arm. 2d, The open work divider to divide the grain falling upon the platform from the gavel being removed therefrom by the rake, when arranged upon the rake-head, in the manner specified. 3d, The spring catch and dog in combination, and the location of said catch, to break the forward motion of the rake and its return by the spring. 4th, The projection on the lower side of the slot or notch in the dog to arrest the catch with certainty. 5th, The application and arrangement of the toothed rack connected with the spring, by which the rake is caught and held after its descent upon the gavel, the rebound thereof is prevented, and the gavel removed with greater certainty. 6th, The placing of a rake (having spring teeth) in the rear of the machine, for the purpose of gleaning and contracting the gavel sheaf into form. 7th, The combination of the cam attached to the main shaft, with the arm of the rear rake, to cause it to pass over the gavels at the proper time. 8th, The ratchet cam and lever in combination, for throwing both rakes into or out of action.

280. APPARATUS FOR HEATING FEED WATER OF STEAM BOILERS; J. T. Brooks, New Albany, Indiana.

Claim—The relative arrangement of the force pump, water supply pipe, heater, and steam pipe, conveying steam from the upper part of the boiler or steam dome to the heater, to heat feed water on its passage between the pump and the boiler, by means of living steam, and inject it into the lower region of the boiler.

281. HARROWS; R. W. Buckles, Grayville, Illinois.

Claim—Two harrows hung to one frame, independent of each other, with two vertical toothed wheels also working independently of each other, and connected to the horizontal wheels, which are actuated by means of pinions.

282. OX-YOKES; Washington Burnham, Essex, Massachusetts.

Claim—The mode of applying the pole ring to the yoke, namely, by means of the staple rack and the ring carrier, made so as to be capable of sliding on the rack, and with a pin passage arranged with respect to the notches of the staple rack, as described.

283. CURTAIN RACK; J. F. Calhoun, Wolcottville, Connecticut.

Claim—The combination of tightening screw, collar, pulley, and button, for effecting the required tension on the cord.

284. SEWING MACHINES; P. S. Carhart, Collamer, New York.

Claim—Feeding the cloth by the combined action of the needle and friction pad, when the said needle and pad operate jointly and in unison to propel the cloth, as the needle descends therethrough, the cloth being held in its required position by the needle during the intervals of feed, while the pad is retreating to take a fresh feeding grip on the cloth.

285. BREAD KNIFE; Joseph Carrier, Marlborough, Connecticut.

Claim—The employment of the roller and the adjustable studs with the collars and thumb-nuts, as described.

286. STOVE PIPES; M. C. Chamberlin, Johnsonburgh, New York.

Claim—1st, The employment of the spring tube in connexion with the pipe, in the manner specified. 2d, The arrangement of pipe, C, provided with pin, with pipe, A, provided with slot, a, and spring tube, in the manner specified.

287. HORSE POWER MACHINES; A. B. Colton, Athens, Georgia.

Claim—1st, The stationary wheel and its hub, when the same are placed centrally with the large driving wheel, for giving motion to the pinions and gear wheels, revolving with the driving wheel, so as to impart a rapid rotary motion to the horizontal shaft, having its bearings in the axes of both driving wheel and stationary wheel. 2d, The sectional yoke, in combination with the annular collar and set-screws.

288. JOINERS' BENCH; J. E. Cryer, Peoria, Illinois.

Claim—1st, The movable jaw, B, arranged with reference to the permanent jaw, b, in such manner as to secure properly the lumber to be wrought, and at the same time to form a track or guide for the plane during the operation of jointing and squaring lumber. 2d, Operating the jaw, F, by means of guides, rod, lever, and dog. 3d, The gauge, adjustable vertically, with reference to the jaws, B b, in combination with the scale.

289. CARPET SWEEPER; Henry Davis, Bethlehem, Connecticut.

Claim—The arrangement of the rollers to operate in combination with the yielding brush and with the scraper.

290. HOMINY MACHINES; Wm. Davis, Middleburg, Maryland.

Claim—Providing the outer cylinder with apertures gauged to such a size, as while serving to discharge the hulls also to perform the additional function of discharging the hominy, as soon as reduced to the desired degree of fineness, in combination with the inner cylinder, when the same is driven at the specific speeds, as described.

291. COMPOSITIONS FOR ROOFING; J. M. Day and E. H. A. Oakley, Aiken, South Carolina.

Claim—The ingredients in the proportions set forth.

292. MILL-STONE BUSH; M. DeCamp, South Bend, Indiana.

Claim—1st, The adjustable followers provided with convex sides and backs fitted within an oil-box, and arranged in relation with the collar of the spindle, to operate as set forth. 2d, The serrated or notched wheels, attached to the outer ends of the screws, when used in connexion with the stops attached to the plates, as specified.

293. CHIMNEY CAPS; Charles Douglas, Hebron, Connecticut.

Claim—1st, The valves, and the manner and the position in which they are suspended. 2d, The arrangement of the neck, the top, and the standards, in combination with the valve, or its equivalent.

294. DRY GAS METRES; Samuel Down, City of New York.

Claim—Constructing or arranging the mouths of the channels of communication between the inlet and outlet pipes, and the measuring chambers and valve chamber of a dry gas metre, to dip down in the wells below the said pipes, as set forth.

295. RAILROAD CAR COUPLINGS; Christian H. Eisenbrandt, Baltimore, Maryland.

Claim—The plates with the springs, the prong-grasping grippers, with the spring latch, constructed as set forth. Also, the hitching pin or bolt, provided with the chain and button or ring, when used in combination with the clasping prong grippers and brake lever, as set forth. Also, the combination and arrangement of the sliding belts with the prong-clasping grippers, as set forth.

296. DEVICE FOR SECURING LIGHTNING RODS; John A. Enggren, Brooklyn, New York.

Claim—An insulator for lightning rods, composed of a glass standard, a spring clasp, having shanks, and shoulders, and otherwise made as described.

297. DEVICE FOR CLAMPING THE BOLTS IN CIRCULAR SAWING SHINGLE MACHINES; Kasson Freeman, Fond du Lac, Wisconsin.

Claim—The arrangement of the sliding or adjustable block with weights attached, or their equivalents, when used in connexion with the sliding jaws.

298. TIES FOR COTTON BALES; Edward Garrett, New Orleans, Louisiana.

Claim—The combination of the two plates, &c., when arranged to form a tie for iron bands for baling cotton, or for similar purposes.

299. TRUNK LOCK; E. L. Gaylord, Terrysville, Connecticut.

Claim—The arrangement of the bolt with the springs and tumbler, to operate as set forth.

300. HORSE RAKES; Elisha Geiger, Lancaster, Pennsylvania.

Claim—The arrangement of the cross-bar, having the flat springs and heads, and provided with arms for actuating the supporting bar with and in relation to the clearing rocker shaft.

301. CASES FOR STEREOSCOPIC PICTURES; Henry Glosser, City of New York.

Claim—1st, The arrangement of two or more pairs of eye-glasses on the same side of a stereoscopic case, so that several persons can look at the pictures at one and the same time 2d, The picture frames, arranged with cogs, or th ir equivalent, at their lower edges, in combination with the cams, j j′ j″ j‴, or their equivalents, whereby the same are made to travel from one pair of eye-glasses to the other. 3d, Giving a double motion to the picture frames, first in a direction transversely through the case by the action of the cam, g, or its equivalent, on the endless belt, E; and second, in a longitudinal direction by the action of the cams, j. 4th, The arrangement and combination of the endless belts, E E′, to operate in relation to the channel, G, substantially as d scribed. 5th, The cams, g g‴, arranged in combination with the cams, j j′, &c., or their equivalents, in such manner that they produce the within described motion of the picture frames at alternate intervals.

302. WASHING MACHINE; Arthur Gray, Naples, Maine.

Claim—The improved washing machine, as made with a set of fluted rollers and a fluted presser or bucking-board applied to the reservoir, as described, in order to enable the clothes to be both rolled and beaten during the operation of washing the same.

303. STEAM BOILERS; Benjamin L. Griffith, Hazel township, Pennsylvania.

Claim—The combination of the single smoke-stack, single chamber, and double series of flues, with the hollow-hing d doors and diaphragms, arranged as set forth.

304. PIANO-FORTE ACTION; Napoleon J. Haines, City of New York.

Claim—The cross-shaped or four-armed fly, applied in combination with the jack, the key, and the hammer butt, to operate as set forth.

305. MACHINE FOR FILING SAWS; A. Hadley, Lynn, Massachusetts.

Claim—1st, Determining the bevel of the teeth of a straight saw, by means of pivoting the frame (which supports the rail and saw-plate,) at h, and hinging rods, to said frame, and confining these rods in their relative position by set-screws. 2d, Determining th bevel of the teeth of a circular saw by arranging the shaft of the saw between two points, l and n, one of the points, n, being adjustable by means of a grooved piece, block, and set-screw. 3d, Determining the bevel of the straight and circular saws by combining the frame with grooves, forming arcs of a circle, in combination with clamp screws and slotted plates. 4th, Holding the file by clamps, r‴ r″, set-screws, o″ o″, in combination with shaft, n″, set-screw, p″, and bracket, m″, constructed in the manner set forth. 5th, The combination of the movable table with the mechanism for supporting and moving the saws, constructed and arranged thereon as described, whereby the same machine can be quickly adapted for filing either straight or circular saws. 6th, The combination of the mechanism for supporting and moving the saws with the mechanism for supporting and operating the file.

306. HUBS FOR CARRIAGE WHEELS; Luther T. Hazen, Coventry, New York.

Claim—Enclosing wood hubs for carriage wheels, or other vehicles, with metal cases which form the pipe box and bands, in the manner described.

307. MACHINE FOR RAISING RAILROAD TRUCK; Wm. Henney, Wapello, Illinois.

Claim—The balance, arranged with the arms and with the extensions to operate in combination with the piston, the serrated bar, the pawl, and with the eccentric disc, in the manner described.

308. OVENS; John F. Hoffmeister, Alton, Illinois.

Claim—The arrangement of the flues which terminate in the chamber, in combination with the additional flue, to operate in combination with the rotary platform, as specified.

[A rotary platform is arranged over the flues which convey the heat from the fire-place, and the heat is carried by two other flues (uniting into one,) over the platform, so that the dough which is placed on the platform is exposed to a considerable and uniform heat during the first half of its rotation, and to a less heat during the latter half of its rotation, and so a loaf of bread, or other article, is well baked after it has been once rotated on the platform.]

309. CLOTHES DRYER; C. R. Hurlbut, Yorkshire, New York.

Claim—The arrangement of standards, side rails, cross rails, and sash, provided on their under side with buttons, the whole being jointed, and the several parts acting conjointly in the manner specified.

310. COOLERS FOR BEER; Charles Jones, Brooklyn, New York.

Claim—The shell arranged in the cooler, so as to form the two compartments, to operate in combination with the coil, as described.

311. MANUFACTURE OF WATER-PROOF CEMENT PIPES; Alfred Fauvin Jalourean, Paris, France; patented in France, December 30, 1857.

Claim—The manufacture of air and water-tight tubes or pipes by the process set forth.

312. SEPARATORS FOR SMUT MACHINES; G. P. Jordan, Burlington, Iowa.

Claim—1st, The combination and arrangement of the scourer with the spout, chamber, and box, provided with the blast chambers, spout, B, fan, and screens. 2d, The employment or use of the valves placed in the partition plates, when used in combination with the fan, chamber, spout, D, and scourer, and arranged relatively therewith, as set forth.

313. CHURN; William Kelly, Hastings, Michigan.

Claim—The combination of the dashers with the slide partition and connecting rods, the parts being so connected to the frame that the oscillations of the churns shall operate the dashers, and force the cream against and through the slide partition—not intending to claim the operation of the dasher or dashers by the oscillations of the churn, but only the combination and arrangement of the vibrating dashers with the movable partition and concomitant parts, as described.

314. HARVESTING MACHINES; Jesse Little, Chambersburg, Pennsylvania.

Claim—The arrangement of the sliding brace, in combination with the tongue and bar, constructed and operating in the manner described. Also, the combination and arrangement of the caster plate, jaws, and segments, in the manner described.

315. PROPELLING AND STEERING APPARATUS; Murdick Lythe, Alleghany, Pennsylvania.

Claim—1st, The shaft, b, with a supporting arm or arms and bearing recess, in combination with the propeller or paddle-wheel shaft, E, arranged in the manner set forth. 2d, The tubular shaft, c, with gear wheels at the upper and lower ends, in combination with the shaft, b, and propeller shaft, E, arranged in the manner set forth.

316. PROPELLER; Levi H. Markley, Line Lexington, Pennsylvania.

Claim—The arrangement and combination of the peculiarly acting paddle blades or fliers, pivoted frame, rods, hooks, sliding block, and reversing and bracing bar, as described.

317. METHOD OF FORMING PLOUGH HANDLES; George W. Matthews, York, Pennsylvania.

Claim—The arrangement and combination of the carriage provided with the patterns or curved surfaces, the adjustable rotating cutter head, belt, and adjustable shaft, provided with the pinion and the rack attached to carriage.

318. METALLIC PIPE; W. S. Mayo, City of New York.

Claim—The application of longitudinal strips to the surface of a metallic pipe, in combination with the coiled wire covering, whereby I am enabled to insure great strength with a less thickness of metal.

319. BAG FASTENER; Wm. P. Maxson, Albion, Wisconsin.

Claim—The employment of the oblong grooved faced plate, or its equivalent, having two segments of its middle portion punched out, so as to admit the string and fasten it to the bag, in combination with the string and ring, when constructed to operate upon the principle of the wedge.

320. EGG-BEATER; Thomas McBean, Fowlerville, New York.

Claim—The double spiral dasher, in combination with a square box, where the same are arranged substantially as specified.

321. SEED PLANTERS; John McKown, Geardstown, Virginia.

Claim—The arrangement for united operation of the horizontally-moving hand lever, vertical shaft, horizontal elbow lever, horizontal slides, divided hopper, seed tube, and vacuum plate, as set forth.

322. SEATS AND COUCHES FOR SLEEPING CARS; Thomas E. McNeil, Philadelphia, Pennsylvania.

Claim—1st, Two adjacent seats, each seat having detachable cushioned boards, G and E, and each having a permanent end frame and a rear frame, with upper and lower ledges, in combination with the swing bracket and rib, or their equivalents, arranged so that the cushioned boards, G, of the two adjacent seats may form one couch, and the boards, E, of the same seats another couch, and so that when the said boards are arranged as couches there may be a space between them and the permanent end frames. 2d, Constructing and arranging the end frames of four seats, so that they may serve as supports for the cushioned platforms, which form the two intermediate berths.

323. ATTACHING THILLS TO AXLES; John Miller, Bucyrus, Ohio.

Claim—The adjusting and securing the hook on the pin, by means of the circular face on the jaws, and the shoulders on the iron.

324. THRESHING MACHINES; John R. Moffit, Piqua, Ohio.

Claim—The described arrangement of fixed bearings, set-screws (in the line of adjustment), and hinged concave heads, the whole operating together to set and rigidly retain the toothed portion of the concave at any desired proximity to the threshing cylinder, while at the side at which the unthreshed grain enters, its distance is substantially unchanged.

325. MACHINE FOR DRESSING KID SKINS; Timothy Newhall, Lynn, Massachusetts.

Claim—The rotary brush, in connexion with the reciprocating bed or carriage connected with its guide rods by springs, the parts being arranged to operate as set forth.

326. SMUT MACHINES; T. A. Noble and Erastus Coy, Akron, Ohio, and James B Angell, Alleghany, Penna.

Claim—1st, The adjustable hoop, in connexion with the increased chamber, F to regulate the blast passing up through the circular opening, N, also the adjustable ring, D, to regulate the blast coming up through the circular opening E; the operation in both cases being to increase or diminish the blast, as may be required. 2d, The chamber, G, in combination with arm, F, and spout, L, when said chamber is placed above the revolving chamber, H, to catch the screenings. 3d, The revolving chamber, H, provided with sides and rim, for distributing the wheat evenly as it falls over the edge of the rim, so as to be more effectually operated upon by the blast passing up the opening, E, and also the flanch, M, upon cylinder, L, for the similar distribution of the wheat to the second blast rising through opening, N. 4th, Making the conical scourer adjustable perpendicularly, both independently of shaft, A, and disc, I, and in connexion with said shaft and disc.

327. MACHINES FOR CUTTING SOLES; John S. Shattuck, Malden, Massachusetts.

Claim—The alternating or vibrating segment carrying the two cutters, having the toe and heel in opposite directions. Also, the yielding table which supports the leather as it is fed forward, and the yielding gauge by which the leather is brought to the right position to be operated upon by the cutters. Also, the projecting knife-edge at the heel and toe of the cutter, by which the scraps are detached from the strip of leather.

328. FOLDING CRADLE; L. K. Selden, Haddam, Connecticut.

Claim—1st, The rockers of a cradle arranged with slats, or their equivalents, and operating in combination with the bottom braces, the upright cross-bars, the longitudinal bars, and the top bars, in the manner specified. 2d, The arrangement of the slides, in combination with the bottom braces, and with the upright cross-bars, to operate as described.

329. STRAW CUTTERS; George Roushe, Lima, Ohio.

Claim—The relative arrangement for united operation in a straw cutter of the reciprocating cutting knife, when arranged in a circularly-moving frame, reciprocating feeding rake, and rising and falling pivoted pressboard.

330. PLATFORM SCALES; Elnathan Sampson, St. Johnsbury, Vermont.

Claim—Attaching the rails of the platform direct to the sleepers, which are connected at each end by links to yokes fitted on levers, the lower ends of said levers, at each side of the platform, being connected together and to the shaft of the scale beam by rods. Also the employment or use of the adjustable rods attached to the levers, to permit of the compensation of the same, for the purpose specified.

331. BUCKLES; Adolph Roesler, Warsaw, Illinois.

Claim—The tug-plates, the trace-plate, having one or more knobs, the fork-shaped hame hook, and screw-rod, all arranged as described.

332. Car Couplings; Richard Rickkon, Rochester, New York.

Claim—Constructing self-adjusting car couplings with a series of grooves, so so as to admit of the coupling (with self-couplers) of cars of unequal heights.

333. Burners for Vapor Lamps; Robert Ramsey, Philadelphia, Pennsylvania.

Claim—The combination of the wick tube, the gas chamber, the tube, and jet, arranged as described.

334. Stoves; Richard B. Pullan, Cincinnati, Ohio.

Claim—A rotating vessel provided with two grates, and a central row of grate-bars, arranged within stoves in such manner as to form two fire chambers, one above the other, and which may be used alternately.

335. Machine for Stripping and Cutting Sugar Cane for Grinding; Luther E. Porter, Lake Mills, Wis.

Claim—1st, The divided clasp, arranged as described. 2d, In combination with the above, I claim the spring cutters, arranged as described.

336. Metallic Shields for Boots and Shoes; Jonah Platt and Myron D. Brooks, Akron, Ohio.

Claim—The construction of boot and shoe shields having an opening in front to prevent water or sand from being entrapped between the shield and the leather.

337. Seats for Churches, Schools, &c.; Charles Perley, City of New York.

Claim—The combination of the swinging bracket with the turning seat, connected and acting in the manner specified.

338. Chuck for Screw-cutting; Richard Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The ring having a portion of the inside cut away or recessed for the purpose of making room for the outer end of the cutting dies, said ring being furnished with cams on the inside, and with a spring catch, lever, cam, and locking stud on the outside. 2d, The cam chamber in the die-box, when used in connexion with the cams and ring. 3d, The regulating stud when made in three parts, and used in connexion with the die-box, ring, and spring catch. 4th, The combination and arrangement of the die-box, cutting dies, and cap, with the ring, the whole being arranged as described. 5th, The eccentric lever on the face-plate, when used in combination with the lever, cam, locking stud, and spring catch, as described.

339. Machine for Cutting Screws; Richard Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The combination and arrangement of the levers, rods, stops, and springs, with the holding or sliding head and eccentric lever, in the manner described. 2d, The use of the sliding or holding head and eccentric lever, when used for the purpose of opening and closing cutting dies in chucks for screw-cutting.

340. Spring Balance for Window Sash; F. H. Smith, Plainville, Connecticut.

Claim—The manner of securing the pulleys in the head jamb of the window frame, and the manner of winding up and adjusting the two pulleys through one orifice.

341. Coal Screen; Jasper Snell and John R. Deihm, Pottsville, Pennsylvania.

Claim—The arrangement of the plates or blades in parallel planes with spaces between their edges, so as to slope lengthwise of the screen and crosswise from the centre of the screen.

342. Friction Pulleys; Edward Spalding, Wesborough, Massachusetts.

Claim—The combination of the tubular rest with the driving pulley, the hanger, or its equivalent, and the shaft of the driving pulley, the pulleys being arranged and made to operate with respect to one another, as specified.

343. Sails for Fore-and-aft Rigged Vessels; A. Washington Stewart, Cambridge, Maryland.

Claim—In fore-sails the clue-sail, of the form specified, united to the after-leach of the fore-sail, and managed by sheets, as set forth.

344. Seed Planters; Stephen L. Stockstill, Medway, Ohio.

Claim—The described arrangement of the open notches, pivot, drag-bar, and pin, constructed in the manner set forth.

345. Mechanism for Varying Speed; James A. Stoddard, Milford, Massachusetts.

Claim—Graduating or varying speed by means of pulleys, or their equivalents, operated in connexion with surface wheels, or their equivalents, in such manner as to receive and transmit the motion at variable distances from their centres, when constructed and operating substantially in the manner set forth.

346. Portable Wagon Jacks; Henry Stowell and Lorenzo Spencer, Placierville, California.

Claim—The peculiar arrangement, combination, and adaptation for the purpose of raising the axles of wagons, and other heavy bodies, to which the foregoing invention may be adapted.

347. Weighing Scales; Francis M. Strong and Thomas Ross, Brandon, Vermont.

Claim—The employment of an auxiliary frame, in combination with, and interposed between, the platform and levers. Also, constructing such intermediate frame in two parts, connected by movable joints at the angles. Also, the manner of constructing and inserting the bearing blocks that rest on the knife edges. Also, bringing the ends of the arms immediately one above the other, in combination with the mode of connecting the two with the beam by single and double connecting rods, substantially as described.

348. Platform Scales; Francis M. Strong and Thomas Ross, Brandon, Vermont.

Claim—Arranging the series of rocking levers which sustain the platform, with their shafts all parallel, and with the arms of all of them in the same line, except those constituting the inner section, which are inclined, in combination with the transmitting lever above, which connects with the scale beam, to the short arms of which they are all suspended at equal distances from the axis of vibration. Also, the method of connecting the several sections of the shaft of the transmitting lever, by means of projections and links, for the purpose of enabling it to yield freely to inequalities or variations in the supports, that it may vibrate freely and without binding, and thereby transmit the weight accurately to the scale beam, as described. Also, suspending the bearing blocks by two links, in manner substantially as described, so that any swinging motion of the levers will not cause the blocks to vibrate on the knife-edges, by which means we are enabled the better to preserve fine knife edges, so essential to accurate weighing. Also, constructing the bearing pieces with convex face and projecting tenon, whereby they are rendered self-adjusting, that the knife edges may bear without binding. Also in combination with the nose-iron, adjustable by a screw in the end of the transmitting lever, the employment of a spring bearing against the end of the adjusting screws.

349. MACHINE FOR CUTTING IRREGULAR FORMS; Isaac T. Tice, Baltimore, Maryland.

Claim—The employment or use of the vibrating bed with fence or gauge and feed or pressure rollers, attached in connexion with the rotary cutter head fitted in stationary bearings on the platform or table, the whole being arranged as set forth.

350. SUGAR CANE HARVESTERS; Robert R. Taylor, Reading, Pennsylvania.

Claim—The two sets of rotating cutters, one set being situated above and in advance of the other set, in combination with the reel and shield, as set forth.

351. MACHINE FOR CUTTING SOLES; John Thompson, Marblehead, Massachusetts.

Claim—The arrangement and application of entire sole-cutters (viz: such as are capable of cutting out an entire sole, finished on its sides, toe, and heel,) on opposite sides of a rotary shaft, so that after each semi-revolution of such shaft, and during each descent of it, an entire sole, with heel and toe complete, may be cut from the piece of the leather by one of such sole-cutters acting thereon, and while the piece of leather is supported on the bed or block under such shaft. Also, the application of the catch and cams to the pinion, and a spring slider applied to the shaft, and so as to operate therewith, as specified. Also, in connexion with the entire sole-cutters applied to opposite sides of the shaft, and operated as described, a gauge and mechanism to operate it in such manner as first to move it up to the path of the cutter, and carry it away therefrom sufficiently to enable the sole that may have been cut to be discharged from the supporting bed.

352. ROCKING CHAIR; Thomas H. Tatlow, Jr., Palmyra, Missouri.

Claim—A rocking chair, having its arms extended down to the rockers, and its back arranged and operated as specified

[This invention consists in extending the arms of the chair down behind the seat to the rockers, so as to form a circular arc, the under edge of which is provided with saw teeth, which serve to retain the back in any desired inclination, by means of a rod with two rectangular bends at each end, which rod is attached to the back, and the bends of which are forced into the saw-teeth attached to the extension of these arms, by means of springs.]

353. REEFING FORE AND AFT SAILS; James L. Townsend, Newburyport, Massachusetts.

Claim—The application of the gaff to the mast, so as to be capable of being dropped downward, on either side of the sail into or about into parallelism with the mast, as specified, in combination with the application of one or two head reefing lines to the gaff and the sail, so as to enable the slack of the leach and upper part of the sail to be taken up, and also the lower end of the gaff to be secured, in order to effect the reefing of the sail. Also, in combination with the said means of reefing the head and producing the lap of the sail, one or more buntlines or lap-securing lines, applied to the leach and the body of the sail, as described.

354. MOULDING MACHINE; Chapman Warner, City of New York.

Claim—1st, The method of packing the sand by dropping it from any given height. 2d, The mode of obtaining the same result by means of revolving bladed shafts, as described. 3d, The double-hinged flask, constructed and secured by plates and pins, as described. 4th, The table, constructed substantially as described, under and independent of the moulding board, capable only of a vertical motion communicated to it by the arrangement described, or any one equivalent thereto, and working in connexion with the moulding board, through which latter the patterns, which are fastened on the table, protrude. 5th, The mode of supporting the moulding board from beneath and through the table. 6th, The combination of apparatus for packing the sand with the mode of hinging and securing the flask by plates and pins, and with the vertically working table apparatus for withdrawing the patterns from the sand through the moulding board, supported as described.

355. RING TRAVELER SPINNING FRAME; Joseph W. Wattles, Canton, Massachusetts.

Claim—The improved arrangement of the ring flanches by which the traveler is supported, and on which it slides, the same consisting in arranging them with reference to the ring or its axis, substantially as shown.

356. HARVESTING MACHINES; Jesse Whitehead, Manchester, Virginia.

Claim—1st, The supplemental discharging rake arranged with its actuating mechanism, as described, so as to operate automatically and conjointly with the platform rake. 2d, Attaching or suspending the rake-head to the shaft, by means of the pulley, d, rod, oblique bars, and pulley, h, as described, whereby the head is allowed to vibrate, and is perfectly guided or retained on the shaft.

[Letters Patent were granted to this inventor on December 2, 1856, for an automatic raking attachment, on which this is an improvement.]

357. CULTIVATORS; W. I. Wilson, Franklin, Indiana.

Claim—The arrangement of axles, wheels, levers, shanks, ploughs, cross-pieces, guides, and arms, for operating conjointly in the manner set forth.

358. SAW FILER; Solon Wood, White Pine, Pennsylvania.

Claim—The arrangement of the cutters on an arbor, the bearings of which are so arranged that the cutters are subjected to the action of adjustable spiral springs, or their equivalents, in the manner specified. Also, the additional arm which is hinged to the bar, in combination with the sliding pieces, for the purpose of allowing the cutters to follow the action of the springs in two directions, as described.

359. GONG OR BELL FOR SIGNALS; Isaac F. Woodward, Philadelphia, Pennsylvania.

Claim—The escapement bar, constructed as described, in combination with the end and pin of the hammer or striking arm.

360. MACHINES FOR MAKING CLAY PIPES; Henry Aregood, Mansfield Township, New Jersey, and Stephen Ustick, Philadelphia, Pennsylvania, Assignors to John L. Macknight, Bordentown, New Jersey.

Claim—1st, The annular ring upon the core pin (which is also provided with a foot), in combination with a flanch upon the inside of the outer front end of the mould, to retain the core pin in place while forming the bell end of the pipe, operated in the manner specified. 2d, The cam wheel, in combination with the piston, trough, and its connexions, mould, and core pin, for making the bell end and straight part of the pipe at one operation. 3d, The combination of the rock shafts with the two halves of the mould, the former being operated by the cam wheel and shaft, for the purposes described. 4th, The slide, rod, and cam strip, as described. 5th, The arrangement and combination of the cam, rock shaft, and levers, for operating the knife, in the manner specified.

361. WRENCH; Henry J. Behrens, Assignor to Charles S. Pomeroy, City of New York.

Claim—Providing the socket of the screw with a pivot or hinge, substantially in the manner specified.

362. CARPET SWEEPER; Wm. G. Budlong, Assignor to Hamilton W. Conklin and James W. Corning, Hartford, Connecticut.

Claim—In combination with the gear wheel and pinion at either end of the case, the lever, and screw, by which the height of the brush is adjusted and the pinion is engaged with the driving gear.

363. BURGLARS' ALARM; John G. Clark, Assignor to self and Samuel W. Hatch, Augusta, Georgia.

Claim—1st, The employment of one or more cap nipples on a suspended gravitating breech piece or plate, to receive a percussion cap or caps, when said breech piece forms part of a burglars' alarm. 2d, Providing said suspended breech piece or plate with a vertical stem, and arranging to slide over said stem a tubular weight, so that when the alarm detaches from the door and strikes the floor, the percussion force of the breech piece and weight will explode the cap or caps and produce the desired alarm. 3d, Arranging the spring on the stem of the breech piece, between the breech piece and weight, so that the same shall be held far enough apart to allow the necessary movement of the same toward each other to explode the cap or caps when the alarm strikes the floor. 4th, Providing serrations on the under side of the suspending bracket, so that said bracket shall move with the door until it clears the framing.

[This is a little device to be carried in the pocket by travelers. On going to bed it is attached to the door by pushing a bracket in between its upper edge and the upper part of the frame. From the bracket the alarm is suspended by means of a chain above the floor. When the door is opened the bracket detaches and the alarm falls to the floor. The concussion of the breech piece, which carries percussion caps, with a descending weight explodes the caps and produces an alarm, thereby warning the sleeper of the approach of burglars.]

364. APPARATUS FOR COOKING BY STEAM; H. W. Horton, Wheaton, Assignor to Oliver H. Horton, Chicago, and Roswell E. Adams, Wheaton, Illinois.

Claim—The described arrangement of a steam boiler, in combination with a steam chamber, which communicates with a boiler by means of a slide, or its equivalent, and one end of which contains the oven.

[This invention consists in arranging over a closed space formed in the lower part of a box with a flat bottom, a steam chamber, which communicates with the boiler by means of a slide which can be operated from the outside, and part of which forms a separate compartment or oven smaller than the chamber, so that when the chamber is filled with steam the oven will be surrounded by it, except where the door is, the whole being so arranged as to cook articles in the steam or in dry air, and that the oven serves for baking.]

365. HOSE COUPLING; N. N. McLeod, Assignor to Carroll E. Gray, St. Louis, Missouri.

Claim—Making the lip around the conical end, so as to leave a cavity to receive the end of the pipe and the screw nut, when the said lip is a part and portion of the same piece that the cone is, as described.

366. WATER-PROOF SOLE; John W. Smith, Washington City, D. C., Assignor to self and Walter W. Perry, Baltimore, Maryland.

Claim—As a new article of manufacture, the water-proof inside sole, when constructed of the compound above described, placed between two sheets of paper, in the manner set forth.

367. SPLINT BROOM; John W. Wheeler, Assignor to Alden B. Stockwell, Cleveland, Ohio.

Claim—The formation of brooms composed of separate wrought splints, when constructed in the manner described.

368. MACHINES FOR CHANNELING AND EDGING SOLES OF BOOTS AND SHOES; Martin Wesson, Assignor to self and D. B. Wesson, Springfield, Massachusetts.

Claim—1st, The combination of the feed rolls, adjustable knives, and the guide, when constructed substantially in the manner set forth. 2d, The combination of lever, sliding pieces, and knives, when arranged as described, and forming a knife-holding arrangement.

369. CIRCULAR CLAMPS FOR SEWING MACHINES; Stephen G. Tyler, Assignor to self, G. J. Saage, and J. W. Barnum, Quincy, Illinois.

Claim—The combination of a central disc with the convex clamping disc and the flat sustaining disc, for the purpose of dividing the crown and quarters of circular sewing, and presenting the edge of the fabric to the needle, in the manner set forth.

MAY 31.

370. SPRINGS FOR RAILROAD CARS; George M. Alsop, Philadelphia, Pennsylvania.

Claim—1st, The method or arrangement of inclosing an air-tight vessel filled with air in a box or chamber, with a flexible water-proof cover or diaphragm, and surrounding the air vessel with water, or some other suitable fluid. 2d, The arrangement of the convex steel plates which are divided into radiating leaves or segments, connected together at the centre, whose outer edges or peripheries rest upon and slide on the metal ring or plate, and in the recess in the bottom of the top, the whole being arranged for the purpose of forming a flexible metallic support or covering to the diaphragm, to prevent its being strained or ruptured. 3d, The combination and arrangement of the piston, its elastic cushion, the flexible steel plate or plates, metal plate or rings, and the diaphragm, arranged as described.

371. SEED PLANTERS; C. F. Anderson, Charlestown, New Hampshire.

Claim—The ratchet-shaped projections in the hub of wheel, and on the disc of the tube, in connexion with the tube provided with the spiral and straight grooves in which the projection of the tube is fitted—the tube having the side lever attached, and also the catch, the whole being arranged as set forth.

372. STRAW CUTTERS; Ensign Baker, Fredonia, New York.

Claim—1st, The employment or use of the leger knife, provided with the hook, actuated by the cam, and used in connexion with the knives attached to the wheel, and provided with the hooks. 2d, The arrangement of the crank spring with rack attached, and the ratchet on the shaft of the feed roller to feed the stuff intermittently to the knives, as described.

373. TOBACCO PRESSES; John A. Bawsel, Powhattan Court House, Virginia.

Claim—1st, The use of the follower fitting into the groove of the opposite roller. 2d, The springs, as constructed and operated for guiding the tobacco and straightening the leaves as they pass between the rollers. 3d, The use of the treadle, in combination with the springs and with the rollers for separating the springs, and also for separating the rollers, as set forth. 4th, The oil cup and roller in connexion with groove, for oiling the groove and the tobacco.

374. ELEVATORS FOR HOISTING GOODS IN WAREHOUSES; Albert Betteley, Boston, Massachusetts.

Claim—So arranging and combining a rider with a brake, by the means described, or their equivalents

as to operate on a drive-pulley to check or prevent its rotation whenever the driving belt breaks or is removed.

375. FREIGHT CARS; Joseph D. Billings, Rutland, Vermont.

Claim—Placing a metal shoe, single or continuous, between the studs or sheathing boards and sills of railroad cars, for excluding the water, and thereby preventing the rapid decay of the same.

376. WRENCH; John W. Brewster, Stamford, New York.

Claim—A wrench having a six-sided handle, stationary jaw, and sliding jaw, with apertures of the precise form shown.

377. MACHINE FOR PUNCHING METAL; Jay H. Brown, Grand Ledge, Michigan.

Claim—The application and use of the bars, in combination with lever, punching bar, frusto-conical rollers, rod, and spiral (or equivalent) spring, for the purposes specified.

378. PUMP GEARING; John P. Carr, Mattapoisett, Massachusetts.

Claim—The device, as set forth and described, for operating pumps on board of ships, and in other places where said invention may be useful.

379. STOVES; Frederick Bucher, Columbia, Pennsylvania.

Claim—In combination with the fire cylinder, the double radiators, each inclosing an interior chamber and register, so that the draft may be direct or checked at pleasure in its passage through the stove, by which means I obtain much radiating surface and economize much fuel.

380. JOINERS' CLAMP; John Clackson, Milford, Pennsylvania.

Claim—The clamp formed of the bar, with the jaws arranged and fitted on it, substantially as described.

381. COMPOSITION FOR PENCILS; E. P. Clark, Holyoke, Massachusetts.

Claim—The composition for pencils for indelible writing, made by combining nitrate of silver with the several other ingredients herein specified.

[The marking inks so commonly used for marking linen, or other fabrics, are inconvenient and troublesome, each bottle being accompanied by a number of "directions," which considerably bother the brains of housekeepers. This pencil will prevent all this, as all the preparation necessary is the damping of the fabric which is to be marked, when the pencil, which is composed of nitrate of silver, nitric acid, glue, lampblack, and sugar, will leave an indelible mark thereupon.]

382. MACHINE FOR GRINDING SAWS; William Clemson, East Woburn, Massachusetts.

Claim—The elliptical bearings, lever, and double gearing, in combination with the adjustable bearing plates, arranged as specified.

383. CHURN; Jacob Closs, Decatur, Indiana.

Claim—The use of the screw dashers, constructed as set forth, in connexion with the wings.

384. CORN CRUSHERS; T. B. Coursey, Frederica, Delaware.

Claim—The employment or use of the serrated flanches placed obliquely and eccentrically on the shaft, in combination with the crushing heads and shell.

385. GAS REGULATORS; E. Hall Covell, City of New York.

Claim—1st, The combining of the rotary pump or air-forcer with the air receiver and its fluid valve arrangements, in the manner set forth, whereby the one controls the action of the other, and through their joint action the charging apparatus is controlled. 2d, Connecting the commingling chamber of the charging apparatus with the air receiver, for the purpose set forth.

386. HYDRO-CARBON VAPOR APPARATUS; E. Hall Covell, City of New York.

Claim—1st, Constructing the apparatus, for the purposes set forth, of detachable parts or chambers. 2d, The arrangement of the feed pipes or tubes and outlet pipes, whereby I am enabled to pass in the material to any one of the chambers, or to let out material, and to examine the interior while the apparatus is in operation, and the process of charging going on.

387. RAILROAD CAR TRUCKS; G. F. Decker, Scranton, Pennsylvania.

Claim—The axles, of a truck, in separate or independent frames, attached to the bed-piece, and connected by a spring or flexible plate, and used in connexion with the spring.

388. HAND LEVER; Edward J. Durant, Lebanon, New Hampshire.

Claim—Combining the forked shaft with the sliding head-piece, the intermediate lever, and the hand lever, in such a manner as to form a compound leverage car-mover, that can be operated as set forth.

389. CULTIVATORS; Celestin Eastburn, Spencer County, Kentucky.

Claim—The arrangement of the ploughs, wheel, block, spring, and rake, as set forth.

390. MACHINERY FOR CRUSHING AND MIXING SUGAR; Fred. Ebelin, City of New York.

Claim—1st, The reciprocating plunger acting on the sugar-loaf, in combination with the revolving cutter-head, in the manner specified. 2d, The support and latch, actuated as set forth, and acting to drop one loaf of sugar at a time from the hopper, so as to be pressed forward by the plunger. 3d, The sliding bar fitted with the incline, in combination with the pins on the wheel, and the weight, or its equivalent, for drawing back the plungers, in the manner specified. 4th, The revolving mixers, constructed with slats between the heads, in the manner set forth.

391. MACHINES FOR DRYING FIBROUS SUBSTANCES; Jeremiah Essex, North Bennington, Vermont.

Claim—The manner herein specified of guiding an ascending and descending endless apron by the pulley, or their equivalents, acting on the edges of said endless apron.

392. LOOMS FOR WEAVING PLAIDS, &c.; Merrill A. Furbush and George Compton, Worcester, Massachusetts.

Claim—The employment of two sets of ratchet wheels and appendages, each set consisting of reversed ratchets, in combination with two sets of cams and two series of shuttle-boxes. Also, two sets of reversible ratchets and appendages, the two sets of cams, and two series of shuttle-boxes, in combination with one pattern chain or cylinder, in manner specified.

393. WASHING MACHINE; George Geer, Uniontown, Illinois.

Claim—A washing machine provided with a lever, cylinder of rollers, clutch, endless belt, adjustable levers, made as set forth, so that by shifting the lever the motion of the belt will cease, and hold the clothes

at rest beneath the rotating cylinder of rollers, and so that the belt may be loosened or tightened when desired, by shifting the levers.

394. TANNING LEATHER; Jacob Gove, Milford, New Hampshire.

Claim—Giving to the liquor or tanning fluid in the vat a rapid motion, commencing across the bottom of the vat and under the suspended hides, for the purpose set forth.

395. CONSTRUCTION OF PINS FOR SECURING ARTIFICIAL TEETH; John Hassell, Jr., Newark, New Jersey.

Claim—The splint-pin, used double or single, half round or flat, for the purposes set forth.

396. MEAT CUTTER; Henry Havell, Newark, New Jersey.

Claim—1st, The hook-pointed rotary knives, arranged in the described relation to the hopper. 2d, The combined arrangement of the stationary curved knives, latitudinal grooves, and rotary knives, as set forth.

397. RETORTS FOR DISTILLING COAL OILS; Robert W. Hazlett and John H. Hobbs, Wheeling, Virginia.

Claim—1st, Constructing the horizontal retort with a pan or flat-shaped base and inclined upper sides or top, and with open conduits or gutters running from end to end of the retort, and arranged on the inner sides thereof, and set inclining and emptying into the neck of the retort, the whole for united operation, as set forth. 2d, The drawer or charger when open at top, and in no way or at any time attached as a fixture to the retort, and yet serving during the distilling process as a part of the generating chamber, and being kept elevated above the bottom of the generating chamber, and allowed to slide in and out without the necessity of removing or disconnecting any portions of the retort or generator.

398. RETORTS FOR DISTILLING OIL FROM COAL; J. E. Holmes, Newark, Ohio.

Claim—The employment in a retort for distilling oil from coal, of a central perforated tube, suspended from the mouth-piece, an open space being also left below the bottom of tube, for the removal of the coke residuum through the mouth.

[This improvement consists in the employment, within an upright retort, and at or near the centre thereof, of a perforated tube, through which the vapors, or a great portion of them, can escape to the exit pipe as fast as they are eliminated, without being drawn or forced into contact with the heated sides of the retort, as the greater portion of the vapors are caused to do in the ordinary stationary retort, by the packing of the coal in the centre of it.]

399. WHEEL JACK FOR CARRIAGES, &c.; Henry Hooton, Massachusetts, and J. G. Bicknell, Cambridgeport, Massachusetts.

Claim—1st, The combination of the hollow box with the lever, the front jointed pawl, the back pawl, and the notched shaft. 2d, The combination of the button, E, the spring, the catch, the button, H, and the jointed connecting rod, as described.

400. DOOR LATCH; Mark Howland, Waterbury, Connecticut.

Claim—The specified relative arrangement for united operation of the latch, with female screw-threaded socket, latch guide plate, with square opening, latch shank or rod, with male screw-thread on its front end, stationary slotted guide case, shoulder on the latch shank or rod, spiral spring, sliding connecting link or plate, with cross-heads and double-acting knob-tumbler.

401. MODE OF SECURING CORKS IN BOTTLES; Robert W. Huston, Calais, Maine.

Claim—The metallic pieces which are hinged on a wire secured below the enlargement on the bottle neck, and which are provided with teeth with the strips, and with the wire and clasps, arranged in the manner specified.

402. SEWING MACHINES; A. B. Irving, Terre Haute, Indiana.

Claim—The arrangement relatively to one another of the following parts, to wit: the upper and lower feeding arms, upper and lower rack shafts, actuating cam, combining and regulating projection, and slotted adjustable spring holding down bar, for the purposes set forth.

403. RETORTS FOR DISTILLING OIL FROM COAL; Wm. G. W. Jaeger, Baltimore, Maryland.

Claim—1st, The side channels and the trap openings or discharge pipes for the heavy oils. 2d, In combination with said side channels, the double inclination or arched form of the bottom of the retort. 3d, In combination with the coal oil retort, constructed substantially as above set forth, I claim the opening, for the purposes set forth.

404. MACHINERY FOR TRANSMITTING MOTION; Mathaus Kaefer, City of New York.

Claim—The arrangement of the carriage and fly-wheel, in such relation to the crank that the weight of the carriage and of the fly-wheel acts on the crank, in the manner specified.

405. FIELD ROLLERS; George Lindley, Chicago, Illinois.

Claim—The vibrating scrapers, constructed and arranged so that the driver can operate them to clear the rollers of the earth adhering to them, when the machine is drawn in either direction. Also, constructing and arranging the platform so that the ends which support it may vibrate freely under it, when the rollers pass over uneven ground.

406. CHURN; W. H. McClintock, Frankfort, Ohio.

Claim—The employment of the specified peculiarly constructed circularly vibrating suction and force-pump, in combination with a churn, constructed with a perforated partition.

407. SUCTION HOSE; Charles McBurney, Roxbury, Massachusetts.

Claim—The rings, operating in the manner set forth.

408. MODE OF CONNECTING AND DISCONNECTING MACHINERY BY MEANS OF A BELT; Tindal A. Madison, Terre Haute, Indiana.

Claim—1st, The combination of the shifting bar with the belt, the driving pulley, and the series of dead rollers, or their equivalents. 2d, The combination of the shifting bar and box with the gate or pawl, or their equivalents. 3d, The guide plate with its slot, in combination with the friction roller, or their equivalents, for the purpose of giving both forward and lateral motion to the belt, when moved from a state of rest. 4th, The series of dead rollers, for the purposes and arranged in the manner set forth. 5th, The lever, in combination with the slots, the stud, and connecting rod, for the purpose of operating the gate or pawl, in the manner described.

409. WATER-TIGHT SINK; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—The production of water-tight sinks formed from vulcanized india rubber or gutta-percha, substantially in the manner set forth.

410. SEATS AND COUCHES FOR RAILWAY CARS; Thomas E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, The end frame of the seat, with its slotted stop and the slotted plate secured to the side of the car, in combination with the back and its pins or bolts, when the several parts are adapted to, and arranged in respect to, each other, substantially as set forth. 2d, The arms, so hinged to the inside of the end frame as to be folded down under the seat during the day, and elevated so as to form supports for the couches during the night. 3d, The vertical frames hinged to the side of the car, and furnished with ledges to support two couches. 4th, The board, its rod, and the hangers, when arranged as set forth.

411. DEVICE FOR OPERATING THE INDEX OF TIME REGISTERS; Robert McKenna, Rossville, Tennessee.

Claim—The moving of the pencil, in the manner described.

412. HARVESTING MACHINES; John Macpherson, Pennington, New Jersey.

Claim—1st, The curved, slatted, flexible apron, when constructed in the manner set forth. 2d, The combination of the endless apron with the curved, slatted, flexible apron, arranged in the manner set forth.

413. CULTIVATORS; R. M. Melton, Criglersville, Virginia.

Claim—1st, The combination of the adjustable links with the adjustable slide, arranged as described, for the purpose of adjusting the distance between the ploughs. 2d, In combination with the curved plough beam, the coulter, constructed and arranged substantially as described, whereby the draft of the side ploughs is regulated by sliding the coulter on the beam and firm support given to the coulter in passing through compact soil.

414. LOCK FOR REPEATING FIRE ARMS; J. R. Mock, Elizabethtown, Kentucky.

Claim—The use of the coiled spring, in combination with the sliding lock, the catch, catch spring, and grooved barrel, and grooved breech-pin.

415. MANUFACTURE OF CORRUGATED BEAMS; Richard Montgomery, City of New York.

Claim—The roller, A, with its peculiarly formed projections and recesses, in combination with the roller, B, with its peculiarly formed projections and recesses, arranged in relation to each other, as set forth. Also, the rollers, A and B, in combination with the former, C, said parts being arranged in relation to each other, as and for the purposes described.

416. APPARATUS FOR SEASONING LUMBER; M. R. Moore, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the track rails, or their equivalents, with a steaming and drying chamber or vessel, fitted with steam pipes and stop-cocks or valves, so as to operate therewith, in the manner specified.

417. BROOM; D. J. Owen, Springville Lynn, Pennsylvania.

Claim—A broom provided with a leather bag, spring, and otherwise made as described.

418. CROSS-CUT SAWING MACHINES; G. W. Parker, Fitzwilliam, New Hampshire.

Claim—The cross-head and the several parts attached to it, whether arranged as shown in Figs. 1 and 2, or as in Fig. 3, together with the piece, X, or its equivalent, to work the arms, V and N, to raise the saw and the handle, to hold the saw when raised.

419. CHURN; J. R. Parker, Sing Sing, New York.

Claim—The combination of the rotating faces of the disk with the stationary faces, in the manner set forth.

420. CHAIRS FOR RAILWAYS; J. F. Peabody, Salem, Massachusetts.

Claim—The arrangement and application of rail bearers with respect to the elastic bearing, its cap plate, the base plate, and under the rails of the railway chair, and particularly with the elastic bearing and cap plate, arranged and protected by a recess, essentially as explained.

421. MILLS; A. E. Pirkey, Bradford, Illinois.

Claim—The described arrangement of the adjustable slides and the corner pieces, to operate in combination with the piston which receives its motion by means of a lever and wheels, in the manner specified.

[The invention consists in a device by which the distance between the sides of the shell and piston can be regulated, so that the flour or meal may be brought to any desired state of fineness.]

422. SCREW DIES; A. P. Pitkin, Hartford, Connecticut.

Claim—Making a screw plate, with both top and bottom parts which hold the die, cast or made on to the screw plate, in the manner described. Further, the making the inlet for the introduction of the die into its chamber, between the parts through the outside edge of the screw plate, as described.

423. CLOVER HULLERS; Christian Reif, Hartleton, Lewis Township, Pennsylvania.

Claim—The projections at different angles on the concave, in combination with the spiral rows of projects on the cylinder, as set forth.

424. NUT CRACKER; Ezra Ripley, Troy, New York.

Claim—The described nut-cracker or implement, consisting essentially of the fixed jaw, with its standard, the movable jaw with its slide, and the eccentric or cam with its handle and flanch, as described.

425. SAWING MACHINE FOR RE-SAWING BOARDS; A. C. Ross, Almont, Michigan.

Claim—1st, The arrangement of circular saw and stationary divider, in connexion with a permanent horizontal bed in re-sawing machines. 2d, The bell-shaped flanches or sockets of the saws, constructed as described.

426. SELF-ACTING WAGON BRAKE; Joseph Rosencrans, Avoca, New York.

Claim—The arrangement of means set forth, for operating the brake by the holding back of the team.

427. STOVES; George H. Russell, Baltimore, Maryland.

Claim—The combination, with the inner fire drum, of the cold air base, vertical side pipes, and elbow, with their dampers, cylindrical cover, or top drum, with its chambers and connecting tube, horizontal air space and outlet, with air-drums, passage, front vertical register pipes, foot-warmer connecting pipes, and foot-warmer, with its register, ventilating registers, double smoke-pipes, with dampers, set as described, and divided outer smoke-drum, with its passage or passages, substantially as set forth.

428. CARPET FASTENER; A. M. Smith, City of New York.

Claim—The combination and arrangement of the point, a, lips, b b, slot, c, bearing, d, lips, e e, point, f, hook, g, lips, h h, bearings, i i, as specified.

429. MANUFACTURE OF BELTING; Charles, E. Smith, Philadelphia, Pennsylvania.

Claim—The manufacture of continuous belting or boards by uniting pieces of band iron, by lapping and riveting two beveled ends, so as to produce a rhomboidal joint, in the manner described.

430. COÖPAGE MACHINERY; George Stephenson, Northfield, Indiana.

Claim—The employment of a series of movable bearing cross-bars with side pivots or gudgeons, the ends of the cross-bars being supported by longitudinal slots or grooves in the flyer bars, and connected to each other by elastic straps or thongs, whereby the cross-bars are made to press gently upon the ends of the spools (which are mounted upon the side pivots), to resist slightly the rotary motion thereof, and also admit of the occasional removal of one or more of the spools, without disarranging others of the series, the cross-bars, spools, and elastic straps being arranged in the manner described.

431. AXLE-BOX FOR RAILROAD CARS; Levi Stevens, Fitchburg, Massachusetts.

Claim—A box made of anti-friction metal and backed with a casing of bronze, the bronze passing through the anti-friction metal, and resting upon the axle, for the purpose described.

432. CONDENSING STEAM ENGINES; John Sutton, Assignor to self and DeWitt C. Van Tuyl, City of New York.

Claim—1st, The arrangement of the combined air pump and condenser piston, K, to act independently of the walking beam of the engine, so that a portion of the exhaust steam, while the piston, F, is first completing and commencing a stroke, shall impart a full stroke to the piston, K, as described. 2d, The arrangement and combination of the forked levers, Q S, the crank, E, lever, R, and piston rod, K′, so that by the action of the piston, K, the crank, E, will be assisted in passing the dead points, but during other portions of the crank movement, the parts above named will be disconnected from the crank, E, as described.

[In this invention, the air pump and cylinder of a condensing engine are combined, and the cold water injection is so applied that condensation takes place in the air pump, and the use of a separate vessel as a condenser dispensed with. The air pump is operated by the direct pressure of the exhaust steam upon its piston, without any aid from any other part of the engine, and the surplus of power in the air pump over and above what is necessary for the discharge of the water of condensation from it is used to help the crank or cranks past the centres.]

433. MANUFACTURE OF WRENCHES; George C. Taft, Worcester, Massachusetts.

Claim—The peculiar mode of constructing the head and shank of screw wrenches, namely, by first forming or constructing the head and shank or bar separately, as described, and then uniting the head and shank after the shank has been inserted into the depression first made in the head by welding, the whole operation being substantially as described.

434. SEEDING MACHINES; T. H. Tatlow, Jr., Palmyra, Missouri.

Claim—1st, The employment or use of the covering hoe, operated from the supporting wheel through the medium of the rollers, bar, J, and the bars, F I, connected by the rod, H, as described. 2d, The share, O, provided with the curved bars, j j, in connexion with the shares, M N, and hoe, arranged as set forth.

435. CORN MILLS; J. W. Taylor, Philadelphia, Pennsylvania.

Claim—The application and arrangement of the oblique projections to the shell or concave, operating in the manner specified.

436. TAILORS PRESSING MACHINE; J. W. Thorp, Hillsboro', New Hampshire.

Claim—Raising the heater from the bottom of the hollow goose, either by means of the projections formed on the bottom of the heater, or by adjusting screws, or their equivalents.

437. BEE-HIVES; S. H. Walker, Somerville, Tennessee.

Claim—The moth decoy entrance, provided with the jutting lips or ledges arranged just within the bee entrance across its entire extent, both above and below, in the manner specified. Also, the construction and arrangement of the cross-bars attached to a supporting cross-piece, and with open spaces around their ends, in the manner set forth.

438. BORING MACHINE; John Waugh, Elmira, New York.

Claim—The arrangement of those mechanical appliances in a peculiar manner, substantially as set forth.

439. GAS REGULATORS; D. Wheeler, Fairfield, and Isaac Little, Bridgeport, Connecticut.

Claim—The combination of a self-acting discharge pipe or siphon with the chamber of a gas regulator, as described.

[An inverted siphon is attached to the gas regulator, and arranged relatively to the outlet by which the burners are supplied, and to the other parts of the regulator, that while containing a column of water or other liquid sufficient to balance the pressure of the gas, it will constitute a self-regulating means of escape for any water or liquid matter that may result from condensation in the pipes between the regulator and the burners.]

440. FRICTION SPRING FOR SUPPORTING WINDOW SASH; E. D. Williams, Philadelphia, Pennsylvania.

Claim—Providing with friction springs having sharpened projections or spurs for cutting their own grooves, as set forth.

441. COTTON AND HAY PRESSES; Samson Wolff, Vicksburgh, Mississippi.

Claim—The combination of a conical spiral wheel or pinion with an inclined rack, when the latter is set oblique to the axis of the pinion, in the manner described.

442. MUSQUITO BAR; Thomas S. Williams, Enterprise, Mississippi.

Claim—The folding musquito net or bar, as described.

443. SEATS AND COUCHES FOR RAILROAD CARS; Theodore T. Woodruff, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the two frames with each other and with the supports therefor, connected with each compartment of a car, the said frame, when spread out, forming couches for two persons, on the same level with the seats, and when transformed one of the said frames forming seats, and the other the back for such seats. Also, connecting the frame which forms the seats with the frame which forms the back, by means of links, connected with one of the said frames by means of hinged joints, and with the other of the said frames by means of sliding hinged joints. Also, in combination with the frame for the main seats, the auxiliary seats which slide under the frame for the main seats. Also, the frame for an elevated couch, when combined with the car, by means of sliding hinged joints. Also, in combination with the elevated couch next to the side of the car, or the equivalent therefor, the front elevated couch, so connected with the car as to admit of being let down to form part of a double couch, and thrown up towards the roof of the car when not wanted as a couch.

444. SELF-ACTING PRESSES; Lester L. Bond, Chicago, Illinois, Assignor to self and Giles B. Williams, City of New York.

Claim—1st, The arrangement for connecting the press beam with the levers by the connecting bars, whereby the press is made to operate from above and below. 2d, The socket shoe and the ratchet plate, or their mechanical equivalents, for altering and gauging the power of the press.

445. MACHINES FOR MAKING UPHOLSTERY SPRINGS; C. A. and S. W. Young, Providence, Rhode Island.

Claim—1st, The cutters, attached to the machine and arranged relatively with the rolls and bar, when the movable cutter is actuated automatically by suitable mechanism to cut the springs as formed from the continuous wire. 2d, The bar, attached to the lever, or other part of the machine or framing, when provided with a bend to project over the uppermost roller, for the purpose of guiding and ensuring the turning or bending of the wire, as set forth. 3d, The plates, when used in connexion with the shears, for the purpose of cutting off the springs and bending the ends thereof simultaneously.

446. MACHINES FOR MEASURING CLOTH; John W. Drummond, Assignor to Horace H. Day, City of New York.

Claim—The combination of the measuring wheel, in combination with the spring block, or the equivalent thereof, for holding the cloth to the periphery of the wheel, and for stopping the said wheel the moment the cloth has passed off.

447. COFFEE POTS; D. G. Fletcher, Assignor to self and Henry Weiskopf, Racine, Wisconsin.

Claim—The box-like strainer arranged with a hinged top, so that access can be had to the same from the inside as well as from the outside, and that the same can easily be cleaned.

448. REFRIGERATOR; Wm. H. Lazelle, Assignor to self and Elbridge B. Lazelle, Boston, Massachusetts.

Claim—The combination and arrangement of the siphon pipe, water space, and ice-box, open and beveled at one end, as set forth.

449. DRY GAS METRES; Hugh Logue, Assignor to self and Daniel P. Vandergrift, Philadelphia, Penna.

Claim—So constructing one of the partitions between two of the chambers of a dry gas metre, that it may afford a passage for the gas from the inlet pipe to the central opening of the valve seat, substantially as set forth.

450. HEMP BRAKE; Henry F. Mann, Assignor to self and Wm. J. Walker, Laporte, Indiana.

Claim—1st, The combination of the adjustable cams or arms with the breaker, as constructed, the whole being arranged as described. 2d, The adjustable spring, as arranged and operated for the purposes set forth.

451. MACHINE FOR CUTTING INDIA RUBBER INTO THREADS; Henry Messer, Roxbury, Assignor to Charles Rice, Boston, Massachusetts.

Claim—The arrangement and combination of the rotating table and the adjustable cutters, as described.

452. GRINDING MILLS; A. Orvis, Niagara, Assignor to self and Downs & Co., Seneca Falls, New York.

Claim—The construction and arrangement of cylinder, D, and concave, F, with supplementary cylinder, G, whereby the rhomboidal teeth, f and g, serve to adjust the parts to efficient action by means of the longitudinal movement of the collar, e, on the shaft, B, substantially as set forth. Also, the peculiar conformation of the grinding surfaces of the cast iron cylinder, E, and concave, H, consisting of the alternate intersection of the raised and depressed corrugations thereof, in the manner described. Also, the combination and arrangement of the two concaves, F and G, spout, J, and divided winged partition, K, or its equivalent, whereby the operation of cracking and grinding in said concaves may be conjoint or separate, substantially in the manner described. Also, the automatic rapper, V, arranged and operated as described, for the purpose of keeping the bolt free from obstructions, and rendering its action efficient.

453. SOFA BEDSTEAD; Wm. H. Tendler, Assignor to self and John F. Moeschlin, Cambridge, Massachusetts.

Claim—The improved sofa bed, constructed not only with each of its arm-rests formed in two parts and hinged together, arranged and applied to the back and bed-frame, but with its seat hinged to the bed-frame, so as to be capable of being moved with respect to it and the arm-rests. Also, the combination of the pillow and foot-rests with the arm-rests and seat frame or seat applied to the frame, the whole being made to operate together essentially as explained.

454. MILL DRIVERS; Ferdinand Walters, Assignor to C. F. Walters and S. H. Stout, Covington, Kentucky.

Claim—The driver, constructed and arranged with reference to the shaft and cap, substantially as set forth.

455. HEEL OF BOOTS AND SHOES; Alfred B. Wilton, Assignor to self and Charles Adams, Dorchester, Mass.

Claim—The improvement of the dished or concave elastic heel, as made with the air channel leading out of the concavity, and arranged as described.

EXTENSIONS.

1. MACHINE FOR GINNING COTTON AND WOOL; Stephen R. Parkhurst, City of New York; patented May 1, 1845; extended May 3, 1859.

Claim—Arranging the metallic rings composing the burring cylinder so near together that no burrs or seeds, &c., can fall in between them, the rings having hooked teeth cut in the periphery, and so placed around the cylinder as not to have the teeth on any two adjoining rings to come opposite to each other, by which the wool or cotton is drawn in below the surface of the rings and the seeds or burrs are cleaned off. Also, the combination of the burring cylinder with the feeding cylinders and trash cylinder, to separate the fibres of cotton or wool from foreign or useless substances.

2. PRINTING PRESSES; Richard M. Hoe, City of New York; patented May 1, 1845; extended May 3, 1859.

Claim—The lifting of the cylinder when it is desired that it should not bear on the form as it revolves, such lifting being effected by means of apparatus connected with the lever, arranged as described. Also, the manner of constructing the spring box or apparatus used by me for checking the momentum of the bed in a cylinder press, but which may be advantageously applied in other machines for a like purpose, said spring box or apparatus being furnished with a centre shaft carrying a toothed wheel that gears into wheels or pinions on several surrounding shafts, the whole of which shafts carry spiral springs, arranged and combined so as to co-operate with each other in the manner described.

3. STOVES; F. L. Hedenberg, City of New York; patented May 7, 1845; extended May 10, 1859.

Claim—The particular manner, as set forth, in which I arrange and combine the flue and air-heating

spaces, and the pedestal of my stove, the hot air space being between the ascending and descending draft, the descending draft spreading around the base of the stove.

4. The Manufacture of India Rubber Fabrics; Nelson Goodyear, late of Newtown, Connecticut, Henry B. Goodyear, Administrator; patented May 13, 1845; extended May 17, 1859.

Claim—The intermingling and combining fibrous substances with the gum in forming india rubber fabrics, solid and firm in the body, with a smooth surface resembling leather.

Additional Improvements.

1. Journals of Railroad Cars; Wm. Baker, Utica, New York; patented August 11, 1857; additional dated May 3, 1859.

Claim—1st, Placing a cylindrical coiled spring around the piston, immediately above the socket to be used, instead of the volute spring below the piston and within the socket. 2d, I do not claim generally a ball valve, as this is in common use in various connexions, but I claim the use of the ball valve, in combination with the enlarged chamber, and the arrangement described for communicating and sustaining the oil in contact with the journal. 3d, I claim the use of the flat spring to be used for vibrating the piston, together with the arrangement I have described for seating the piston on the spring.

2. Mangles; D. Cumming, Jr., Mobile, Alabama; patented July 27, 1858; additional dated May 3, 1859.

Claim—The employment or use of the cylinder, c, having an elliptical surface upon a portion of its periphery, and having a fixed axis of rotation, the cylinders, D, having a movable axis of rotation, and the eccentric cams arranged upon a movable rod, and their pressure being regulated by suitable springs.

3. Modes of Ventilating Railroad Cars; D. H. Fox and John Fink, Reading, Pennsylvania; patented May 8, 1855; additional dated May 10, 1859.

Claim—As an improvement on our patent aforesaid, the construction of the fan chambers with outlets at each extremity, and their combination with the other portions of the ventilating apparatus.

4. Ore-crushing Machines; Samuel F. Hodge, Detroit, Michigan; patented May 26, 1857; additional dated May 17, 1859.

Claim—The alternate lifting and dropping of a stamper or hammer, by means of the combination of the vertical rod with two or more clamping rollers, the peripheries of which are not complete circles.

5. Cooking Stoves; Samuel B. Spaulding, Brandon, Vermont; patented June 22, 1858; additional dated May 17, 1859.

Claim—The extension of the flues under the hearth, as described.

6. Bow Whiffle-trees; Freedom Monroe, Romeo, Michigan; patented Aug. 20, 1858; additional dated May 24, 1859.

Claim—The bearing bar, the chain and braces attached thereto, and the paddled swivel joint, to be used in combination with my improvement in harness, disclaiming the original invention heretofore patented.

7. Apparatus for Evaporating Saccharine Juices; Lyman P. Harris, Mansfield, Ohio; patented Jan. 18, 1859; additional dated May 31, 1859.

Claim—1st, The application of one or more dampers to the movable furnace; also the cooling surface on the evaporator connected therewith. 2d, The movable flue, as described. 3d, The broad hook or supporter, or its equivalent, as set forth.

Re-Issues.

1. Gas Burners: John R. O'Neil, Kingston, New York, Assignee of Yarnall Bailey, Philadelphia, Penna.; patented October 12, 1858; re-issued May 3, 1859.

Claim—Producing a light which may be increased or diminished at pleasure, by means of the adjustable heater or heat receivers, operating in connexion with a wick tube or holder, and the flame of the lamp or burner.

2. Knitting Machines; Nelson P. Aiken, Troy, New York; patented July 13, 1858; re-issued May 3, 1859.

Claim—Stopping a knitting machine when the yarn accumulates in its needles by the action of the accumulated yarn.

3. Shuttles for Weaving Cloth; James Baldwin, Nashua, New Hampshire; patented January 31, 1840; extended for seven years from and after January 31, 1854; re-issued May 3, 1859.

Claim—Furnishing the shuttle with a spring and catch, so arranged that the bobbin will be received or released at one operation.

4. The Mode of Converting the Backs of Car Seats into Beds or Lounges; Henry B. Myer, Buffalo, New York; patented September 19, 1854; ; re-issued May 3, 1859.

Claim—1st, The use of the backs of car seats for forming upper horizontal beds or lounges. 2d, So arranging the backs of contiguous seats, that they meet and remain in the same horizontal plane. 3d, The use of a cushioned surface intermediate between the cushioned surfaces of two car seats, so as to form with the same a horizontal bed, berth, or lounge, said intermediate cushion forming an attachment to, and appearing as part of, the car seat, when not adjusted to aid in forming a berth, bed, or lounge. 4th, Forming a continuous line of lower horizontal beds, berths, or lounges, of a series of car seats in railroad cars, by uniting the several seats so as to fill up the entire space between the seats with adjustable cushioned attachments of the seats, whatever be the character or disposition of said attachments, so long as they form and appear as parts of the seats, when not adjusted to form said continuous line of lower beds, berths, or lounges.

5. Retorts for Distilling Oils from Coal; John Nicholson, Alleghany, Pennsylvania; patented February 15, 1859; re-issued May 3, 1859.

Claim—1st, The use of a straight or curved, or straight blade or blades placed on the agitators or arms of shaft, for the purpose of agitating, lifting, mixing, and bringing all parts of the mass within the retort in contact with the heat. 2d, The arrangement near the outer edge of one end of a retort, of four or more supply and discharge openings, and on the other end near the outer edge of four or more exit pipes placed on a line with, and opposite to, the supply and discharge openings.

6. Copper Pots; Wm. H. Elliot, Plattsburg, New York; patented January 25, 1859; re-issued May 10, 1859.

Claim—1st, The combination of boiler, still-worm condenser, conducting plate, and the external opening

of the still-worm at g', when these devices are so arranged in relation to each other that an opening to the external air shall be provided for the non-condensible gases, while the condensible vapors are reduced to a liquid without coming in contact with the condenser water, and then turned by conductors into the boiler. 2d, The arrangement of the joint below the spout, so that vapor can pass through the spout without first passing the joint. 3d, The employment of conductors, in combination with the condenser, for the purpose of filling the water joint or keeping it full.

7. Mowing and Reaping Machines; J. W. Mulley, Amsterdam, New York; patented Dec. 16, 1856; re-issued May 10, 1859.

Claim—1st, Connecting the frame of the platform with the frame carrying the driver and raker's seat, in the manner set forth, namely, securing the relative position of the two frames by means of the brace in the rear, and the laterally inclined draw-shoe in front. 2d, The shoe, in combination with the tongue attachment in front thereof, the said shoe being constructed and arranged as described. 3d, The rod and the rails, connected in the manner described, in combination with the pole, the rocking shaft, and the lever. 4th, The arrangement in relation to the driver's seat of the lever and mechanism connected therewith, for raising and lowering the cutter bar, whereby the sickle may be raised in the manner described.

8. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—The endless chains, composed of metallic links provided with protuberances or depressions, when used in combination with suitable driving chain gears to impart a positive motion to the straw-carrier of a threshing and separating machine.

9. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—In combination with a receptacle in which the tailings are deposited by the winnowing apparatus, the arrangement of the screw elevator in relation to the threshing cylinder, for the purpose of returning the tailings to be re-threshed.

10. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—The reversible screen and delivery spout, arranged with, and to the discharging spout of, the "fanning mill" or "shoe" of a threshing machine, so as to be isolated from the winnowing arrangement, and made to deliver at either one side or the other of the machine.

11. Grain Separators: John R. Moffitt, Piqua, Ohio; patented Dec. 1, 1857; re-issued May 17, 1859.

Claim—The arrangement of disconnected shafts, carrying pinion chain gears, rotated at equal speeds from a single shaft or driver, and acting to drive the endless apron from its lower end, while permitting the escape of the straw through the lower openings of the apron.

12. Machinery for Preparing Oval Picture Frames: Wm. Gardner, City of New York; patented August 17, 1858; re-issued March 15, 1859; re-re-issued May 17, 1859.

Claim—The combination of a scraper adapted to the form of the moulding, with the revolving face-plate of a lathe, when the said scraper is so arranged as to be self-adjusting laterally to the said moulding.

13. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Dec. 1, 1857; re-issued May 17, 1859.

Claim—The construction and arrangement of the rotary beater within the apron, in combination with the falling sections.

14. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—1st, An elevated binding table, in combination with the platform for receiving the grain as it is cut. 2d, The combination with the binding table of one or more binders' stands on a lower level than that of the table. 3d, The combination of a binding table with a binders' stand, having an elevated side for the binder to rest his legs against, and thereby steady himself without the aid of his arms, both of which are thus left at liberty *to* do the binding. 4th, The arrangement of the rakers' and binders' stands, so that the grain may be raked from the platform, and delivered upon the binders' table before the several binders' stands. 5th, The arrangement of the dumping-tray with the rakers' and binders' stands.

15. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—1st, The combination of the finger beam and the main frame with a yielding coupling arm, whereby the progressive movement of the finger beam over the ground will be controlled by the main frame, and its upward and downward movements by the undulations of the ground over which it is drawn. 2d, The combination of a yielding coupling arm and a yielding brace bar with the finger beam and main frame. 3d, The combination of the yielding bars and the removable bolts, or the equivalent thereof, with the finger beam and main frame, whereby the finger beam may be allowed to slide loosely on the ground to adapt the machine to mowing, or be held firmly above the ground to adapt the machine to reaping.

16. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The short finger beam, in combination with the yielding connexion with the main frame, or its equivalent.

17. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of the finger beam with the hinges by which it is drawn, arranged above the plane of the cutter.

18. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of a counterpoise weight, or the equivalent thereof, with that end of the finger beam next the main frame, to equalize its pressure upon the ground. Also, the combination of a counterpoise weight, or the equivalent thereof, with each or either end of the finger beam, to diminish its pressure upon the ground.

19. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of a stop with the mechanism for connecting the finger beam with the main frame, and allowing it to rise and fall.

20. Manufacture of India Rubber Goods by means of Zinc Compounds; Horace H. Day, City of New York, Assignee of Henry G. Tyer and George Helm, New Brunswick, New Jersey; patented Jan. 30, 1849; re-issued August 7, 1849; re-re-issued May 24, 1859.

Claim—India rubber fabrics made by the combination of caoutchouc, in its several varieties, with the sulphuret of zinc, or the bi-sulphuret of zinc, or the hyposulphite of zinc, or the sulphite of zinc, and also with zinc compounds in their several forms, as set forth, and sulphur, and in combination with these in either case, the submitting said compound to the action of steam at a high temperature, the whole being combined and manufactured substantially as described.

21. Apparatus for Raising Water; Wm. T. Barnes, Buffalo, New York; patented March 20, 1849; re-issued May 24, 1859.

Claim—1st, The combination of a casing whose sides slope outward from the induction opening with a revolving piston, the edge of whose blades conform to, and run near to, the sloping sides of the casing or the spiral rib. 2d, In combination with a casing whose sides slope outward from the eduction openings, I claim a rotating piston, with fixed blades, inclined upon the face to the axis of the piston rod. 3d, Dividing the stream of liquid as it enters the casing containing the rotating piston, by causing it to pass through two or more induction openings, arranged so that the blades of the piston pass over these openings.

22. Inkstands; Thomas Bobjohn, City of New York; patented August 25, 1857; re-issued May 24, 1859.

Claim—1st, The arrangement for flexing the elastic diaphragm, by attaching a mechanism in connexion with the cover for the ink cup, that the opening and closing thereof shall effect the raising or discharge of the ink, or other fluid, into or from said cup. 2d, The cover, arranged and operating as above set forth, in combination with the elastic or flexible diaphragm and a non-corrosive fountain or ink cup, when operating as specified. 3d, The combination and arrangement of cam lever and plunger, or the equivalents thereof, for effecting the raising or discharge of the ink by raising or closing the cover of the non-corrosive fountain cup. 4th, Arranging the cam centres in such relation to each other that, by raising the cover, the requisite depression of the diaphragm will be produced to obtain the required result.

23. Cracker Machine; John McCollum, City of New York; patented March 23, 1852; re-issued May 31, 1859.

Claim—The combination of adjustable springs with a cracker cutter and its resisting surface or bed.

24. Machine for Creasing and Blacking Leather for Harness; Adolph Stempel, City of New York; patented Nov. 2, 1858; re-issued May 31, 1859.

Claim—1st, The pressure roller and the creasing and embossing rollers, in combination with the color fountains and felt rolls, arranged to operate as set forth. 2d, The arrangement of the embossing rollers with their projection flanches, to operate in combination with the guides, in the manner specified.

25. Plates for Boiler Holes and Tops of Stoves; David Stuart and Richard Peterson, Philadelphia, Penna., Assignees (through mesne-assignment) of John B. Chollar, Albany, New York; patented February 6, 1849; re-issued May 31, 1859.

Claim—Constructing a cross-piece for cooking stoves and ranges with a hollow chamber, and with the openings to allow air to pass into the said chamber, as set forth.

26. Grinding and Polishing Knives; James Dodge, Waterford, Assignor to self and David Blake, Albany, New York; patented October 12, 1858; re-issued May 31, 1859.

Claim—Grinding and polishing articles, and forming their surfaces upon or against the periphery of a grindstone or polishing wheel, or other analogous reducing surface, by attaching them to the periphery of a revoking drum or cylinder. Also, making matrices in the periphery of a wheel to which a series of articles to be ground are attached, said matrices being adapted to give the required shape to the articles to be ground, so as to grind, polish, and shape such articles in a uniform manner. Also, in combination with said matrices, attaching and supporting the articles to be ground upon the cylinder, in such manner as to allow them to rock or accommodate themselves thereon, whereby their surfaces may be shaped either convex, flat, or concave.

27. Gas Lamps; George H. Bechtel, Assignee (through mesne-assignment) of Horatio G. Sickles, Philadelphia, Pennsylvania; patented August 7, 1849; re-issued May 31, 1859.

Claim—1st, Forming a valve within the adjustable gas chamber, and a seat for the said valve on the tube which contains the wick, so as to regulate and extinguish the light when required, whether the said valve be made and arranged in the manner described, or other means substantially the same, by which similar results may be produced. 2d, The employment of the safety valve, in combination with the guard, constructed substantially as described. 3d, The guard, in combination with the combined burner and generator, arranged in the manner set forth. 4th, Combining the generator, burner, ring, and guard, in a single piece, made to ascend and descend simultaneously, in the manner set forth.

Designs.

1. Burial Case; John McMurthry, Assessor to George C. Murthry, Fayette, New York; dated May 3, 1859.
2. Spoon and Fork Handles; Wm. H. Lewis, Glastenbury, Connecticut; dated May 3, 1859.
3. Stoves; Sherman S. Jewitt and Francis H. Root, Buffalo, New York; dated May 3, 1859.
4. Watch Guards; George Blanchard, City of New York; dated May 10, 1859.
5. Stove Plate; J. W. Lane, Newton, New Jersey; dated May 10, 1859.
6. Stoves; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated May 17, 1859.
7. Sepulchral Monuments; Richard Barry, Boston, Massachusetts; dated May 24, 1859.

JUNE 7.

1. Printing Oil Cloths; James Albro, Elizabeth, New Jersey.

Claim—Forming ornamental figured surfaces on oil cloth, by raising parallel ridges or surfaces, b, on the ground color, when in a soft or green state, by means of a properly prepared block pressed upon it; and then forming parallel ridges or raised surfaces, d, at right-angles thereto, and in the form of the design or desired configuration, by means of a properly prepared block. It being understood that I claim the privilege of having either the ground, b, or figure, d, one of them only, if desired, composed of dots or broken lines or ridges, in order to obtain a similar effect.

2. BREAKWATER; D. Hillen Armour, Columbia, Texas.

Claim—The projecting or overhanging sand plate, applied in combination with the diagonal walls of the breakwater, as described.

[This breakwater is designed to protect a channel across a bar from the flow of sand which comes in upon the bar with each tide, and thus keep the channel open without the necessity of making the channel in the bar narrower than the channel in the river. This will, of course, give accommodation to more ships entering a river with a tide, and will ensure a course for ships even at low water.]

3. WASHING MACHINE; D. S. Ayres, Hope, New Jersey.

Claim—The revolving discs or heads with the mode of operating the same, as applied to washing machines.

4. DEVICE FOR RAISING WATER; J. A. Ayres, Hartford, Connecticut.

Claim—The wind-wheel, vane, endless chain, with buckets and weight attached, the cylinder and annular receiving trough, arranged for joint operation substantially as set forth.

5. REVOLVING FIRE ARMS; Thomas Bailey, New Orleans, Louisiana; patented in England, Jan. 17, 1859.

Claim—1st, The placing of the within named working or actuating means within the body, as set forth. 2d, The revolving chamber working on two adjustable centres of suspension instead of in the ordinary way. 3d, The mode described of connecting the barrel to the body. 4th, The stopping or retaining of the revolving chamber by means of a spring stop acting on the ratchet, such stop being actuated by a cam on the tumbler. 5th, The notch or cavity in the cap guard or cock-nose, to fit upon the solid part of the chamber, and retain the chamber in a safe position.

6. BRIDLE BITS; J. B. Baker, Syracuse, New York.

Claim—The attachment, as described, of sliding rings or rein connexions to the curb bars of bridle bits, when the same are operated upon by springs attached to the bit, in the manner set forth.

7. CHIMNEY COWL; Henry Bedlow, Newport, Rhode Island.

Claim—The arrangement and combination of the chimney top or tube, A, chamber, F, tubes, G, or other external draft passages and deflectors, the tube chamber and draft passages communicating with each other and the external air, to operate as set forth.

8. METHOD OF SAWING SHINGLES FROM THE BOLT; N. Boardman, Fond du Lac, Wisconsin.

Claim—1st, The employment or use of two bolt carriages, when used in connexion with the adjustable planes, and arranged in the relation with the circular saw, as shown, so that a shingle may be sawed from each bolt at each movement of its carriage, and the two bolts operated upon simultaneously by means of one and the same law. 2d, The adjustable or tilting tracks or bolt frames, in combination with the reciprocating carriages and saw, arranged to operate as set forth.

9. ENAMEL COMPOSITIONS FOR BRICKS, &c; Decius W. Clark, Bennington, Vermont.

Claim—The enamel or glaze for pottery ware, or other articles formed of the ingredients, and substantially as specified.

10. IMPROVEMENT IN TANNING; John Brainard and W. H. Burridge, Cleveland, Ohio.

Claim—The described process of treating skins or hides in a preparation of liquor or liquors, as described.

11. POCKET-HANDLE FOR BILLIARD TABLES; John M. Brunswick, Cincinnati, Ohio.

Claim—The pocket-handles, arranged and secured as described, and formed of vulcanized gutta-percha or india rubber.

12. MACHINES FOR BURRING WOOL AND GINNING COTTON; F. A. Calvert and C. G. Sargent, Lowell, Mass.

Claim—A cylinder having spaces between the teeth for the accommodation of the seed, in combination with a revolving guard, operating in the manner described.

13. CORN HUSKERS; J. C. Clapp, Seneca Falls, New York.

Claim—The combination and arrangement of the carriage, fly-clearer, cross lever, concaves, and gauge, blade, and tread lever, operating conjointly as set forth.

14. METHOD OF JOINTING SHINGLES; S. C. Coffin, Lawrenceville, Pennsylvania.

Claim—So combining with the horizontal saw that saws the shingle from the bolt, the transverse piece, and carriage upon it, so that the same saw that cuts the shingles from the bolt may be used for joining said shingles.

15. KNITTING MACHINES; Enoch Colvin, Poultney, Vermont.

Claim—1st, The combination of the needle arm and the iron rim upon the ring, constructed for raising each needle by itself, and completing each stitch before another is begun. 2d, The cylinder for reversing and regulating the motion of the machine while forming the heel and toe. 3d, The combination of the notched wheel, t, the toothed bar with its pointer, the cylinder, the elevating arm, the elevating bar and cam thereon, and the pin on the wheel, by means of all which the motion of the machine is reversed back and forth, and regulated so as to knit upon a straight hose flaps of the proper form for the heel and toe. 4th, The wheel, P, and the elevating arm, combined with the several parts and devices mentioned in the last preceding claim or paragraph, as above described, for setting in motion at the proper juncture the machinery for regulating the formation of the flaps for the heel and toe.

16. LIGHT SHADE FOR BILLIARD TABLE; David Conlan, City of New York.

Claim—A shade for billiard tables, &c., having two reflecting parts, and otherwise made as described.

17. RAKES; Thomas Crane, Fort Atkinson, Wisconsin.

Claim—My improved harvesting rakes for gathering and elevating cut stalks of grain preparatory to binding the same into sheaves, when the said rake is composed of side handles, gathering fingers, and swinging legs, or the equivalents of the same, as set forth.

18. LOCK; Thomas Dougherty, Macon, Georgia.

Claim—The employment of the spring tumblers, when constructed and operated in the manner described, in connexion with the bolt, the said springs being detained by the key to let the bolt slide.

19. CHAIN PUMP; Daniel Du Pré, Raleigh, North Carolina.

Claim—1st, The endless chain for raising water, composed of the curved detachable links, when said links are constructed and united in the manner set forth. 2d, Keeping the chain stiff between the upper and lower

pulleys, by means of projections on the links. 3d, The combination of the curved links with the peculiarly shaped curved buckets, when constructed in the manner set forth.

20. RAILROAD CHAIRS; Wm. B. Dunning, Geneva, New York.

Claim—1st, The peculiar form of a partly raised and double-slotted bed-plate. 2d, The peculiar form and position of the clamps, one part of them being confined and borne down on the tie by the weight of the rail and all above it, and the other part, viz: the jaw, resting upon the flanch of the rail and holding it fast. 3d, The combination of the several parts, as described, or their mechanical equivalent.

21. HYDRANTS; James Fay, Baltimore, Maryland.

Claim—The arrangement of the stock and chamber, as constructed with the india rubber ball, rod, opening in the top of box, nut, spring, valve stem, valve, and thimble, the several parts being used and operating conjointly, in the manner specified.

22. HORSE POWER MACHINES; Wm. Field, Providence, Rhode Island.

Claim—Arranging and supporting a hollow driving shaft, and the driven shaft passing through the driver, whereby both driver and driven shaft turn in the same direction, and both ends of the driver are fully supported by boxes independent of the shaft passing through it, while at the same time the bearing of the shaft passing through the hollow driver will be on the driver only at a point directly opposite its journal, so that any slight displacement of either shaft will not cause them to bind on each other so as to increase the friction of the machine.

23. MACHINE FOR OPENING OLD ROPE; Archibald Ford, Newport, Kentucky.

Claim—The elevated bar provided with cavities, arranged in the described relation to the feed mechanism and drum, and operating in combination with the latter, to preparatorily open the butts of the rope.

24. MODE OF STARTING CITY RAILROAD CARS; George P. Frick, Baltimore, Maryland.

Claim—The application of a lever acting temporarily upon the axle of a railway carriage, or other wheeled vehicle, in combination with the pulley and chain, and whether the pulley is of uniform or different diameters, as described. Also, such lever, in combination with the ratchet wheel and catch, in their application to railway or other wheeled vehicles. Also, the cord, whereby the lever may be loosened from the catch at the will of the driver, in combination with the said lever, and catch pulley, and chain, when applied to a railway carriage, or other wheeled vehicles. Also, the combination of the catch and ratchet wheel with the chain and weight, described in the foregoing specification, whereby the engaging and disengaging of the catch is operated by the motion of the draft bar.

25. LEGS FOR PIANOS; Felix and Charles Gelin, City of New York.

Claim—The glass socket, so mounted in the legs of musical instruments, that the escape of sound from the instrument to the floor is checked, without injuring the appearance or endangering the strength or durability of the instrument.

26. MONEY BOXES FOR STAGES, &c.; T. W. Gibbons, Franklin, New Jersey.

Claim—1st, The box provided with the drawers, the former having a flap or door in its bottom, and arranged to operate as set forth. 2d, The change slide or plate, one or more, used in connexion with tubes, and arranged relatively with drawer to operate as set forth. 3d, In combination with the drawers and change plate or plates, the bell and index, and dial, arranged as set forth.

27. SAFETY CAGE FOR COAL SHAFTS; D. Glover, Township of Cass, Schuylkill Co., Pennsylvania.

Claim—The construction of the cage in two separate sections, separated at the guides, and so connected by hinges at the top of the bottom of the sill that, when the rope or chain used in hoisting breaks, or the power ceases to operate, the cage shall open at the top where the sections are joined, and the height and weight of each section shall operate as a lever and weight to force the iron shoe on the ends of the sills and pieces powerfully against and into the guides, and by this means entirely prevent the dropping of the cage and car down the shaft.

28. CLEANING SPINNING MULE CARRIAGE TOPS; Robert Greaves, Philadelphia, Pennsylvania.

Claim—The described mode of cleaning mule carriage tops, or any mechanical equivalent thereto.

29. WIND WHEELS; W. L. Gregory, Theresa, New York.

Claim—The arrangement of the main vane and the regulating vane, to operate in combination with the wings, as described.

30. ROCKING CARRIAGE; Albert C. Griswold, Hartford, and Walter R. Griswold, Durham, Connecticut.

Claim—The employment of the rockers, in combination with the seats or cribs. Also, the railway track or frame work with the cords or rods and springs, when used as described. Also, the employment of the elastic substance attached to the rocker, for the purpose described.

31. PADDLE-WHEEL; John W. Harris, Durhamville, New York.

Claim—Constructing paddle-wheels for boats in such a manner that the paddles may be folded laterally upon the frame, and the wheel thereby withdrawn from projecting beyond the sides of the boat, or extended at pleasure, whether the boat be in motion or at rest, the paddles being connected to the frame work, and their outer edges of the form shown.

32. ROTATING DUMPING CAR; Wm. A. Hawkes, Corinth, New York.

Claim—The arrangement and combination of the rotating platform, provided with dumping boxes, with the shaft and gearing, and the clutches, as described, so that the car may be propelled, and the dumping boxes rotated by turning shaft, as desired.

33. MATTRESS; Henry W. Henley, City of New York.

Claim—The use or employment of the serrated section, when the same shall be combined for the purpose specified.

34. HARROWS; J. Herald and C. B. Tompkins, Trumansburg, New York.

Claim—The arrangement of the plates with recesses and projections, and with a hole in their centre, for the purpose of securing the bars and the tooth, in the manner specified.

35. MACHINE FOR MOVING IRON AT THE ROLLS; Charles Hewitt, Trenton, New Jersey.

Claim—The movable floors, platforms, or supports, for moving iron or other metal at the rolls while in process of manufacture, constructed as described, or otherwise substantially the same.

36. MACHINE FOR WORKING BUTTER; Gideon Hotchkiss, Windsor, New York.

Claim—The combination of the lever stern ladle and oblong bowl, by means of the revolving joint, the projecting cope, and follower ladle, as described.

37. LOOM TEMPLES; Wm. H. Howard, Philadelphia, Pennsylvania.

Claim—The rollers twining in bearing or steps, arranged to yield independently of, and in contrary directions to, each other, on the opening of the warp threads, as set forth.

38. CONSTRUCTION OF PRISONS; Enoch Jacobs, Cincinnati, Ohio.

Claim—A secret passage or guard chamber around the outside of an iron plate jail, and between said jail and a surrounding enclosure, constructed and arranged as described.

39. MANUFACTURING KNITTED FABRICS; Joseph K. Kilbourn, Pittsfield, Massachusetts, and Edward E. Kilbourn, Litchfield, Connecticut.

Claim—The new knitted fabric described, composed of columns of stitches oblique to each other, having openings at the places where the oblique columns of stitches diverge.

40. SAW FILING MACHINE; T. E. King, West Andover, Ohio.

Claim—The suspending the file-holder upon arms, so that it is susceptible of adjustment horizontally, vertically, and obliquely, and in combination with the curved faced slot in the holder.

41. MACHINE FOR SAWING CIRCULAR BEVELS; John Lemman, Cincinnati, Ohio.

Claim—The adjustable rest hinged to the bed, in the manner described, and adjustable vertically with reference thereto.

42. BUNG CUTTER; Josiah Kirby, Cincinnati, Ohio.

Claim—The mode of pointing the lower or last end cut of the plug or bung by forcing it into a separate dog, made and used substantially as described. Also, the mode of lifting the plug out of the dog, after it has been compressed, by means of rod, G′, when operated in the manner described. Also, the mode of driving the plug out of the cutter into the compressing dog by movable rod, when operating in the manner described.

43. ADJUSTABLE HAMMER FOR REVOLVING FIRE ARMS; Alex. Le Mat, New Orleans, Louisiana.

Claim—Providing the hammer with a hinged head, so arranged that it shall present the same face in different directions, for the purpose of discharging, in succession, different barrels, or a grape shot pistol and a revolving fire arm, as may be desired, and providing the same with small lateral wings for locking the revolving chambers in position, in the manner set forth.

44. AUTOMATIC FINGER FOR CLOSING THE VENT OF CANNONS, &c.; Alex. Le Mat, New Orleans, Louisiana.

Claim—1st, The apparatus with automatic finger, substantially as described. 2d, The inclined plane, in the manner and purpose described, or as an equivalent, the inclination of the slot of the percussion lock, for the purpose set forth.

45. COMPOUND RAILROAD AXLES; H. J. Lombaert, Philadelphia, Pennsylvania.

Claim—The divided tubular axle and the solid undivided centre piece or mandrel, when the same are constructed and combined together, with each other and with the wheels, so that the said two tubular parts shall project through their respective wheels and form their journals, and also rotate out of contact and independently of each other.

46. FURNACE GRATE BARS; Warren S. Low, Albany, New York.

Claim—The combination of the corrugated and circular removable face piece with the body of a furnace grate bar, in the manner set forth.

47. SHOE SOLE; Wm. J. Lyman, East Hampton, Massachusetts.

Claim—The use, or application, or employment of metallic in-soles to shoes, boots, &c.

48. HARVESTING MACHINES; H. H. Luther, Warren, Rhode Island.

Claim—1st, Attaching the finger bar, P, to the frame, J, suspended on the shaft, K, and fitted between bars, J J, on frame, G, and arranged on shaft, H, so that the finger bar, D, and sickles may, when necessary, be elevated, and placed directly over the main wheel and shaft. 2d, Adjusting the finger bar, P, and sickles, in a more or less inclined position, in order to cut the grass or grain the desired height, by having the finger bar attached to a circular frame, G, fitted on the arm of the driving wheel, and secured at the desired point by means of the lever and projections, or any equivalent fastening. 3d, The arrangement and combination of the frames, J G, applied to the driving wheel in connexion with the gearing, respectively on the wheel, F, shafts, t t, and in the frame, J.

49. BURNISHING MOULDINGS; Robert Marcher, City of New York.

Claim—Attaching a self-adjusting burnisher to a reciprocating plate or carriage, when used in connexion with a moulding suspended and attached to the machine in the manner as shown, or in any equivalent way, to admit of being acted upon by the burnisher.

50. MACHINES FOR FINISHING BRICKS; W. S. Mayo, City of New York.

Claim—The combination of the box, plunger, and plates, with or without the feed block, substantially as set forth.

51. MANUFACTURE OF INDIA RUBBER BLANKETS OR APRONS USED IN THE PRINTING OF FABRICS, BOOKS, &c.; Charles McBurney, Boston, Massachusetts.

Claim—Bringing the blanket to a uniform thickness and smooth surface, by passing it between a revolving emery roll and a revolving feed roll, so arranged with respect to each other that the surface of the feed roll shall be ground by the emery wheel, as set forth.

52. ROTARY HARROWS; J. W. McLean, Lebanon, Indiana.

Claim—The combination of the specified obliquely set teeth, with two or more harrow frames revolving in opposite directions, as set forth.

53. SEWING MACHINES; James S. Moody, Cincinnati, Ohio.

Claim—The employment of an endless belt, arranged and operated as described, to carry one or more hooks to draw the thread through the cloth. Also, the tension collar, embracing the thread and needle, and operating to hold the thread, in the manner set forth. Also, alternately holding and releasing the double pointed needle by means of sliding keys, operating so as to pass through notches towards the ends of said needle at the proper times, arranged in the manner set forth.

54. TRUSS FOR BRIDGES, ROOFS, &c.; Samuel J. Reeves, Philadelphia, Pennsylvania, and Montgomery C. Meigs, Washington City, D. C.

Claim—The mode of trussing or stiffening a curved or arched beam or rafter for bridges or roofs, by means of tension rods or ties of metal, wood, or other suitable material, connected at their outer ends with the arched or curved beam or rafter at various points, and converging towards, and connected together at, their inner ends at a point within the space contained between the arc or arched or curved beam or rafter, and the straight line joining its extremities, substantially as described.

55. APPARATUS FOR DRYING GLUE; M. Newbauer and P. Adelman, City of New York.

Claim—The arrangement of a chamber of circular or polygonal form, which is provided with a fan blower, or its equivalent, to which air of the proper temperature is conducted by means of a pipe and tube, for the purpose of drying the cakes of glue.

56. STEAM BOILERS; Wm. Oldman, Buffalo, New York.

Claim—The central water space in the combustion chamber, arranged in relation to the annular water space, and to the tubes, or their respective equivalents, for the purpose of inducing an active circulation of the water radially among the tubes, with the advantages explained.

57. APPARATUS FOR EXHIBITING STEREOSCOPIC PICTURES; Stuart Perry, Newport, New York.

Claim—1st, A movable frame work for holding a series of stereoscopic pictures, from which the pictures are brought to be inspected, and then returned to it again by a mechanism operated by the user. 2d, Bringing each individual picture or pair of pictures, in succession, to the same point or place, before they are projected from their compartments to be exhibited, by mechanism. 3d, In combination with a movable picture-holder, a reciprocating carrying frame, that catches each picture or pair of pictures, in succession, and carries them to the place where they are to be inspected, and returns them to their compartment again. 4th, In combination with a box or case containing within it a series of pictures and a mechanism for projecting them from said case, a frame work on the outside of said box or case for receiving said picture. 5th, The slots in the picture-holder barrier and in the box or case, so that the picture, from its compartments in the picture-holder, may be projected through both slots or openings to the outside of the box. 6th, The friction brake, or its equivalent, for holding the picture-holder and prevent it from moving until started by the crank. 7th, Making the frame in sections or with an opening, for the purpose of introducing the pictures through said frame into the compartments of the picture-holder as well as removing them therefrom. 8th, The clamps, as applied to single or double pictures, for the purpose of strengthening them, preventing their warping or bending, and thus facilitating their passage through the slot, which they must pass through, to the place where they are exhibited.

58. MACHINERY FOR DRYING PAPER; Edward L. Perkins, Roxbury, Massachusetts.

Claim—Feeding the paper from a roll outside of the drying chamber, through proper openings, to a series of rollers, and then conducting it over said rollers vertically through the apparatus, and subjecting it, during its passage, to a gentle current of heated air, produced by forming inlets at the bottom for the reception of the atmospheric air, which passes up and is heated by a suitable heating apparatus, and escapes readily through apertures at the top, and then out of the drying chamber through proper openings to a receiving roller.

59. TAIL PIECES FOR VIOLINS; John Pfaff, Philadelphia, Pennsylvania.

Claim—The metal tail pieces with an eye adapted to the detachable pin, recesses for the reception of the strings, and with the rib, as set forth.

60. CUTTING OUT STRAP HINGES; Samuel M. Richardson, City of New York.

Claim—The relieving die, in combination with the shaping die and cutter, in the manner specified.

61. DUST-PAN; J. Hall Rohrman, Philadelphia, Pennsylvania.

Claim—A dust-pan, having its bottom corrugated and its back edge seamed over, for the purposes of making the bottom of the pan rigid without extending any brace from the handle, and rendering unnecessary the wiring of the back edge of the pan.

62. FURNACES AND STOVES; Charles B. Sawyer, Fitchburg, Massachusetts.

Claim—1st, The arrangement of the closed-topped fire-pots, gas or combustion chamber, fire or draft flues, small gas openings, and air heating flues, in relation to each other. 2d, The arrangement of the horizontal ventilating flue, ventilating chamber, and exit ventilating flue, and right-angled draft flue, in relation to each other and in the top of the furnace.

63. SPRING BEDSTEAD BOTTOMS; George Schott and John Loudon, City of New York.

Claim—The arrangement of the eyes, elastic cord or strap, and hooks, on the ends of the slats. Also, the studs, constructed and acting to sustain the slats on the strap or elastic cord.

64. GRINDING MILLS; Joseph Sedgebeer, Cincinnati, Ohio.

Claim—1st, Constructing the rotating plate with the same dress or finish upon its grinding face as that of the stationary plate. 2d, The diamond-shaped teeth, arranged as set forth.

65. MEANS OF SECURING THE BITS OF BENCH PLANES; Charles W. Seely and Benjamin F. Locke, Wellington, Ohio.

Claim—Stopping the upper end of the interposed bit below the screw, and upsetting it so as to catch into the cross serrations in the bed-piece.

66. MODE OF SWITCHING OFF RAILROAD CARS FROM ONE TRACK TO ANOTHER; M. Semple, Philadelphia, Pa.

Claim—The immovable switch or turnout, in combination with the guide bars, when arranged as described.

67. MACHINE FOR RAISING WATER; Peter Shank, Jefferson Township, Ohio.

Claim—The combination of the horizontal float wheel, the crank motion (as produced by the three pins) which gives six motions of the pump to one revolution of the wheel, and the horizontal double pump.

68. OPERATING MACHINERY BY DOG POWER; Dexter C. Slater, Lawrence, New York.

Claim—The arrangement and combination of the wheel, shaft, cam, and lever, as set forth.

69. CHEESE-CUTTERS; De Witt Stevens, Newark, New Jersey.

Claim—1st, The arrangement of the platform with the projecting rings, to operate in combination with the corrugated cutting edge of the knife. 2d, The arc, arranged in combination with the platform, with the handle, and with the knife, so that the cheese on the platform can be cut up in slices of any given

weight. 3d, The arrangement and combination of the lever, the link, and the slide, for the purpose of operating the knife.

70. ROCKING CRADLE; W. D. Tewksbury, Cuylersville, New York.

Claim—The two escapement wheels, arranged in combination with the verge and with the arm, in the manner described.

71. METHOD OF PRINTING BANK NOTES; Alfred Tichenor, Newark, New Jersey.

Claim—1st, The making bank notes, and other engraved plates or sections of plates, with tongue and groove or dowel joints. 2d, The locking together tongue and grooved bank note or other engraved plates, by a chase, having it formed with tongue or groove, or with dowels made to match or correspond to the ends and sides of the tongue and grooved plate, which chase is made in pieces, fitted together and furnished with set-screws, as described.

72. BEE-HIVES; Ruggles S. Torrey, Bangor, Maine.

Claim—Providing the troughs in the tops of the comb-bars, arranged with the series of conducting tubes for conveying the feed to the troughs, and with apertures or slots for the free exit of the moisture to the condenser.

73. BRICK MACHINE; William S. Watson, Madison, Indiana.

Claim—1st, The combination and arrangement with a stationary pressing block of an intermittently reciprocating press-box, formed with one or more chambers, and provided with one or more plungers, having a joint motion with the press-box, and an independent movement thereto. 2d, The combination with the intermittently reciprocating press-box, of the top and bottom holding slides, or either of them, arranged to move conjointly with the press-box, and independently of it. 3d, Mounting the intermittently reciprocating press-box with a feed-box, having one or more chambers.

74. MACHINE FOR FINISHING LEATHER; T. F. Weston, Salem, Massachusetts.

Claim—1st, The combination and arrangement of the devices herein described, or their mechanical equivalents, for changing the angle of the tool while the machine is in motion, so as to cause it to operate upon the latter, first with a sharp edge, to take out its inequalities, and then with a dull or blunt edge, to smooth the leather, the successive operations producing the peculiar effect desired. 2d, The arrangement of devices herein described, for giving positive motions to the tool, for lifting it from, and holding it down upon, the bed, the same consisting of the sliding bar and friction box.

75. OMNIBUS REGISTER; Robert F. White, City of New York.

Claim—The spring platform, arranged in combination with the hammer, and with the index, and operated by the lever, or its equivalent, in the manner specified.

76. LOCK ATTACHMENT; John M. Wilson, Philadelphia, Pennsylvania.

Claim—The arrangement, in combination with a lock and door of the box, key-holes, wards, guard, plate, pivoted stops, and springs, arranged in the manner set forth.

77. WASHING MACHINE; Samuel Wiswall, Hyde Park, Vermont.

Claim—The arrangement and combination, within the oscillating cylinder of a receiving chamber, having plates and a door, when said door is corrugated on one side and hinged to one of the plates, so that said door may serve as a rubbing board, and also as a presser.

78. CULTIVATORS; John Young, Joliet, Illinois.

Claim—1st, The combination of the screw extension on the bottom of the standard, with the oblique slotted castings attached to the front side of the cross-bar of the beam. 2d, The combination of the stationary vertically perforated bar with the adjustable rake or harrow arranged on a cultivator, as set forth.

79. BURGLARS' ALARM PISTOL; John G. Clark, Assignor to self, D. G. Cotting, and Samuel W. Hatch, Augusta, Georgia.

Claim—1st, A pistol, arranged on a vertical suspension guide of a hammer, so that the explosion of its cap and the firing of its charges may be accomplished by concussions of the pistol and hammer. 2d, Holding the pistol suspended by the means and in the particular manner described.

80. MACHINES FOR TEMPERING CLAY; J. D. Custer, Norristown, Pennsylvania, Assignor to self and J. M. Roberts, Perth Amboy, New Jersey.

Claim—The arrangement and combination of the stationary toothed rim encompassing the pit, the frame, with the gearing attached to its outer ends, the pinion of the shaft, N, gearing into the rim, and the rod or shaft, F, connected with the frame, the hollow shaft, G, on the shaft, B, and the belt passing around the pulleys, as set forth.

81. STEERING APPARATUS; Wm. Goodsoe, Assignor to self and Isaac Ayres, Manchester Massachusetts.

Claim—The combination of the toothed segment and the curved way, operating as set forth.

82. STOVES; C. Harris and Paul W. Zoiner, Assignors to selves and J. Langstaff, Cincinnati, Ohio.

Claim—The arrangement and combination of the damper, chamber, double-walled case, and pipe, so that the damper which pertains to the oven shall, when drawn out, extend across the bottom of the pipe, and cause the products of combustion to circulate as described, and when closed shall permit a more direct draft.

83. APPARATUS FOR HEATING WATER; George L. Ingersoll, Assignor to J. E. Ingersoll, Cleveland, Ohio.

Claim—The double cylinder heater, the same being united by the plates so as to form the space for the ascension of the heat, and by the pieces, D E, for the passage of the water, the heating space being covered by the cap, and the parts here named being arranged as set forth. Also, in combination with the two cylinders, the ingress pipe, extending to near the bottom of the cylinder, the exit pipe, and the pipe, in connexion with the pipes, D E, for the purpose of establishing a circulation and rapid heating of the water.

84. SHOE-KNIVES; Ira Merritt, Abington, Assignor to self and L. S. Merritt, Weymouth, Massachusetts.

Claim—The described knife-holder, in combination with an extensible blade, so arranged that as the blade is worn it may be protruded.

85. SPIRIT GAS BURNERS; Charles Miller, Assignor to Henry Danford, St. Louis, Missouri.

Claim—The arrangement of the valve over the tube and wick, for the purpose of extinguishing the flame, or regulating its size and altering its direction.

86. Diaphragm for Photographic Cameras; Felix Miller and Alois Wirsching, Assignors to Felix Miller and H. H. Hayden, City of New York.

Claim—The arrangement and combination of the plates, the notched plate, and springs, as described.

[A number of curved plates are placed in a tube in front of the lens, so as to form apertures of different sizes for increasing or diminishing the intensity or sharpness of the light into the camera from the object, in taking photographic pictures.]

87. Power Printing Presses; Jedediah Morse, Canton, Assignor to the S. P. Ruggles Power Press Manufacturing Company, Boston, Massachusetts.

Claim—The improvement in the construction of each of the platen rails, the same consisting in the chute and a notch or depression arranged therein, and with reference to the rollers or tapes, in manner as specified. Also, the arrangement and combination of the slider with the operating cam and the pin or stud on the rocker toggle, such slider being actuated by a foot-treadle, a spring, and the cam of the toggle. Also, the mode of insuring the return movement of the toggles, and their gradual forward motion, after each impression has taken place, the same being accomplished by the notched wheel or its notch. Also, the mode of constructing the gears for operating the frisket-carrier, viz: with the toothed arcs, and the concave and convex arcs, unprovided with teeth. I do not claim the subject of the United States patent No. 7205—but I claim the combination of the two, or any other suitable number of wheels, lever nippers (applied respectively to them), and their opening and closing bars, or mechanical equivalents for such bars. Also, the specified mode of constructing each of the nippers for receiving the sheet of paper from the table, viz: so that each jaw may move away from the other while the upper is being raised, the same producing the advantages not only of insuring the passage of the lower jaw underneath the sheet of paper simultaneously with that of the other jaw over it, but of both jaws closing upon the paper at one and the same time, so as not to lift it out of place. Also, the mode of constructing the lower jaw of each pair of nippers, viz: with a lip or bend arranged thereon. Also, the mode of applying and operating each of the points, viz: hinging or jointing it to the table, and combining with it a stop and lever, or the equivalents therefor. Also, the improved method of operating the frisket-carrier, the same consisting in causing it to descend and pass in an inclined position under the delivering tapes and rollers, while the nippers may be approaching the sheet table, the same enabling the press to be made lower and shorter than when the frisket-carriage is moved horizontally under the said delivering tapes or rollers.

88. Machinery for Cutting Comb Teeth; Wm. Noyes, Jr., West Newbury, Assignor to S. C. Noyes & Co., West Roxbury, Massachusetts.

Claim—In combination with the saw, or the same and its peripheral guide or guides, a mechanism or means of pressing or bending the saw laterally. Also, the mode of producing the lateral and longitudinal movements of the carriage of the comb-carrier, viz: by means of the cam and its screw-thread periphery, arranged and operating in conjunction with a rack applied to the said carriage, as described.

89. Machine for Converting Oscillating Motion into Direct Circular Motion; Louis Planer, Assignor to self and Joseph Auger, City of New York.

Claim—The grooved dog having its tail resting in a recess, or equivalent resting place, in the lever, without being pivoted, or otherwise attached thereto, and having a spring applied in combination with it and the said lever, and the whole being applied and combined with the wheel and its axle, as described.

90. Hooks for Vest Chains; Anthony Wallach, Assignor to self and Adolph Wallach, City of New York.

Claim—The clasping hook, in combination with the bolt in the body of the vest chain hook.

91. Moulds for Pressing Glass; Thomas Shaw, Assignor to self and John C. Bailey, Philadelphia, Penna.

Claim—Forming on the plunger a shoulder of a size corresponding to that of the upper edge of the recess in the base of the mould, and limiting the downward movement of the plunger, so that the said shoulder shall coincide or be slightly below the said upper edge of the recess.

92. Plug Bedstead Fastening; Jacob J. Smith, Assignor to self and J. H. Pugh, Philadelphia, Penna.

Claim—1st, A double plug fastening for bedsteads, consisting of the two distinct parts, so constructed as to be adapted for being driven or secured into the post and rail respectively, and also fitted with a wedge-shaped dovetail tenon, and a corresponding groove, operating together so as to cause the end of the rail to be drawn tightly against the post, in the downward pressure of the said rail, after they are connected together. 2d, Making the post-plug with the inclined dovetail groove across in one side of the same, so as to operate in combination with the wedge-shaped tenon on the rail-plug.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Note as to the Relation of Common and Voltaic Electricity.**

By J. J. Waterston, Esq.

In the seventh series of his "Experimental Researches," Faraday treats of the absolute quantity of electricity associated with the atoms of matter, and sums up with a statement as to the quantity of electricity associated with the chemical elements of a grain of water, which has often been quoted since in a way that tends to mislead as to the potential magnitude of the forces involved. There is an example of this in the last (January) number of the *Edinburgh Review*, p. 235, where the following passage occurs:—"Yet they find authority in the mar-

* From the Lond., Edin., and Dub. Philosophical Mag., May, 1859.

vellous fact, well authenticated by Faraday, that one drop of water contains, and may be made to evolve, as much electricity as under other manner of evolution *would suffice to produce a thunder-storm.*" The mechanical value of the chemical force that unites the oxygen to the hydrogen of a grain of water is well known to be about equal to the weight of 7 cwt. exerted through one foot. That such amount of force would *suffice* to produce a thunder-storm is plainly an idea that cannot be entertained; nor is it strictly implied by the words of Faraday, which are—"The chemical action of a grain of water upon four grains of zinc can evolve electricity equal in quantity to that of a powerful thunder-storm." This was written in 1833, when the application of a mechanical standard or work equivalent to molecular forces was but little thought of. To avoid conveying an incorrect impression now, it would be necessary to underline the word "quantity," and add, "but of *incomparably less intensity* than that of a powerful thunder-storm." The idea of the mechanical equivalent of a grain of water being equal to the mechanical equivalent of a thunder-storm would thus be excluded.

The progress of science, and the labors of Harris especially, has since enabled us to obtain some clearer ideas of quantity and intensity as applied to electricity. When the mechanical value of a constant quantity under different degrees of intensity has been ascertained—and this seems practicable with Harris' apparatus—we shall be in a position to estimate exactly the potential relation between voltaic and common electricity. In the mean time it may be useful to direct attention to certain data which already exist, by means of which we may roughly calculate an approximate result.

The great electric battery of the celebrated Dutch electrician, Van Merum, consisted of 100 jars, each exposing $5\frac{1}{2}$ square feet of coated glass, making altogether 550 square feet. It is stated that this battery, discharged through a length of 25 feet of iron wire $\frac{1}{16}$th of an inch in diameter, fused it so that it was converted into red-hot balls thrown in all directions. Assuming that the heat evolved was sufficient to raise the temperature of the wire 3000 degrees, we have $\frac{1}{512}$ of a cubic inch of iron thus heated; this is equivalent to about $\frac{1}{58}$ cubic inch of water raised 3000 degrees, or 15,000 grains raised 1 degree.

To compare this battery strictly with that employed by Faraday, we should require to know the electric tension of each when charged, as indicated by the same electrometer; also the thickness of the glass in each. Such data are wanting; but, for a rough estimate, we may perhaps assume that they did not differ materially in these particulars.

Faraday states that the quantity of electricity required to decompose a single grain of water is equal to 800,000 charges of a 25 square feet battery, each charge made by thirty turns of a plate-glass machine, 50 inches diameter, in full action. The product of 25 by 800,000 is 20,000,000 square feet of coated glass. This, compared with 550, shows that the quantity of electricity associated with 1 grain of water is upwards of 36,000 times the amount in Van Merum's battery,

and consequently the heating power must be equivalent to 15,000 grains of water raised 36,000 degrees.

According to the experiments of MM. Dulong and Hess, 1 litre, or 61 cubic inches of hydrogen, burned in half a litre of oxygen, gives out heat sufficient to raise 3102 grms. of water 1° C., or 12·3 lbs. 1° F. The water formed by the combustion is 0·00168 lbs. The ratio this bears to 12·3 lbs. is 1 to 7345; so that the heat given out by the combustion of hydrogen sufficient to form 1 grain of water, would raise 7345 grains of water 1° F. in temperature. Comparing this with 15,000 grains raised 36,000 degrees, we arrive at the conclusion that the mechanical value of the electricity required to decompose 1 grain of water is less than $\frac{1}{70,000}$th of the mechanical value of the electricity in the 800,000 charges of the 25-feet battery. Thus eleven charges of this battery represent the integral electric force contained in 1 grain of water.

Edinburgh, February 13, 1859.

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*Durability of Electrotype Work.** By EDWARD RICHARDSON.

In reply to an inquiry made at the Institute of Architects, as to the probable durability of electrotype metal, and its thickness, and for the information of your general readers, I may state that in 1844, being called upon to furnish metal medallions, &c., for the granite testimonial to Major-General Sir Alexander Dickson, K.C.B., &c., near the Rotunda, on Woolwich-common, a very exposed situation, I suggested electrotype castings. A consultation of officers on the question followed, the results being, full permission to reproduce my models in electrotype copper, which was ably carried out in the depth of a severe winter for me, by Mr. Henry Cox, at Battersea, now local manager of the Lizard Serpentine Company. These castings were at that time of unusual size and thickness, viz: 2 feet 6 inches diameter, and fully an eighth of an inch thick of solid metal. This was effected also without shrinking, and every tool touch from the clay model was reproduced. These works have been now exposed for 15 years; and I believe that 500 will give no perceptible change in them. They weighed, as far as I can remember, thirty pounds each. No chasing was required. Mr. Cox, who, if he sees this, may speak for himself, afterwards executed much more extensive works for the Prince Consort, at Windsor, and other patrons.

On the other hand, I have had, for years, a small brass, about fifteen inches high, of my Templar, William, Earl of Pembroke, produced by the old fire process, which cost me pounds to chase, obliterating every line of my original model, and weighs nearly ¼ of a cwt. When are we to rival our foreign neighbors in this important branch? The zinc Berlin process seems forgotton.

* From the Lond. Builder, No. 845.

*On Professor Hughes' System of Type-printing Telegraphs and Methods of Insulation, with special reference to Submarine Cables.** By Mr. H. Hyde.

(Continued from page 51.)

Discussion.—The Chairman said, in inviting discussion and further inquiry into this interesting subject, he would call the attention of the meeting to one or two points which he thought worthy of observation. The idea of the introduction of this self-curing material was perfectly original, and, as an invention, was very beautiful; but practical men would require it to be put to a very severe test before they adopted it. He believed it to be quite within the range of possibility to introduce a sufficient quantity of that viscid material into a telegraph cable, to effect the purpose which they had seen illustrated upon a small scale that evening, in a manner that must have been highly satisfactory to all present. If a fracture took place in the gutta percha covering at the bottom of the ocean, the cure would be effected without the fact of the rupture ever being known, as it would immediately heal itself. The novelty of this discovery, and its application to such a purpose, was highly honorable to Professor Hughes. They must take it for granted that this semi-fluid was a good insulator; and, as it had the property of hardening upon coming into contact with the water, it was likely to become a most valuable adjunct to gutta percha, which was of a porous nature, and liable to injury from fractures. He also thought the invention would be very valuable as applied to the street wires of electric telegraphs, and these afforded great facilities for testing its value. The mode adopted by Professor Hughes for obtaining synchronism in his instrument was very beautiful and novel. Previous attempts in this direction, though repeatedly made, had hitherto not succeeded. With regard to the rapidity with which the signals could be recorded, it was stated in the paper that the Trans-Atlantic intelligence was conveyed between Boston and New York at the rate of from 2000 to 2500 unabbreviated words per hour, which was equal to about 40 words per minute. There was a point upon which it would be interesting to have some information. It was stated that any number of instruments could be used in the circuit, and that there was the power of cutting off the communication from all the instruments, except the one which was being addressed. Supposing the instruments at the two extremities of the circuit to be in communication; for a moment the intermediate circuit would be interrupted. Was there any movement which indicated to the clerks at the intermediate instruments, the fact that signals were passing through the entire circuit, and must not be disturbed?

Professor Hughes replied that that was so, and there was no fear of interruption from the intermediate instruments.

Mr. Wm. Smith thought the experiments which Professor Hughes had shown of the restoration of the insulation should be tested under pressure; for, after all, the main question was to ascertain how it

* From the Journal of the Society of Arts, No. 334.

would behave under the pressure that was due to the depth of the ocean in which the cable was submerged. This might be done in a closed vessel with a force-pump. He thought there was no difficulty in producing a semi-fluid substance which would become solidified by the action of water; but the question was whether, if they covered the wire with this preparation, and then cut through the gutta percha, the pressure would not force the material through the opening and prevent its acting.

The Rev. WALTER MITCHELL had had the advantage of seeing this experiment tried in private, where it could be conducted with greater care and accuracy than in a public room, and the results were highly satisfactory.

Mr. WM. NEWTON begged to ask whether there was any objection to stating what the nature of this viscid composition was? It would be interesting to the members to know.

Mr. HYDE replied that it would afford him great pleasure to furnish as much information as possible on this subject; but in almost every invention there were certain things which it was expedient to keep to themselves. He would add, with reference to these instruments generally, that there were many things which he might communicate if he could do so in justice to the rights and claims of the inventor. Unfortunately, people did not recognise, as he thought they ought to do, the rights of property in inventions, and for that reason inventors were obliged to keep some things to themselves.

Mr. NEWTON added that Professor Hughes had protected his invention by letters patent; and in his specification he was bound to state, not only in what the invention consisted, but also the means by which he proposed to carry it into effect; and when the specification was enrolled, the inventor must give the full details of it. He would say with regard to this insulation, it had been known for some time in the United States, and he had seen observations in the public prints detracting from its merits. He alluded to that in order to observe that, as far as he could judge, those statements were erroneous, and instead of the invention being valueless, it had been properly designated as an exceedingly ingenious mode of insulating the electric conductor. He agreed with the opinion expressed that it was advisable to make experiments in order to ascertain the manner in which this insulating compound would act under considerable pressure. With regard to the Atlantic cable, he had never had any confidence in it. It appeared to him that any metallic coating on the outside must have some effect upon the conductor inside, especially when the conductor was only protected—as in the case of the Atlantic cable—by an imperfect insulator like gutta percha. Mr. Hyde had stated that gutta percha was a good insulator—a remark which he (Mr. Newton) was surprised to hear from one so well qualified to judge of these matters, because it was generally conceded that gutta percha was only a moderately good insulator. India rubber was much better than gutta percha, which had the peculiar property of becoming charged with electricity after it had been used as an insulator for any length of

time, and was therefore likely to induce leakage. He could mention one or two other modes of insulation which he considered preferable to that of gutta percha, and particularly he would notice the invention of Captains Drayson and Binney, of the Royal Engineers. They proposed, instead of a strand of seven wires, to have a single large conductor, and to cover that with a solution of india rubber paid round with silk, or some other non-conducting substance, and to inclose the whole in a vulcanized india rubber tube which contained a column of air. In a conductor upon that principle they had, in the first place, the insulation of the india rubber; secondly, the insulation of the silk; thirdly, that of the air; and, finally, that of the outer india rubber tube. This appeared to him to form a perfect insulator of the electric wire. There were other insulating compositions which had come under his notice professionally, one of which was that of Mr. Leonard Wray, who proposed to make a composition formed of india rubber or gutta percha, mixed with silicious matter, and a resinous substance such as shell-lac. This appeared to him to contain all the elements of a good insulator. He was not, however, aware that this plan had been tested to any great extent. Another method had been introduced by Mr. McIntosh, but he did not consider it so practical as the others to which he had alluded.

Mr. HOBBS remarked that there was novelty in the idea of the material being forced out by the pressure of the water, as stated by some of the speakers. If there was a hole through the gutta percha, he apprehended the pressure on the hole would be the same as the pressure on any portion of the cable, and he could not conceive how, under such circumstances, the semi-fluid matter was to be forced out.

Mr. NEWTON would add, with reference to the remarks of the chairman, that this plan would be applicable to underground telegraph wires—that it appeared to him (Mr. Newton,) to require the action of water to solidify the viscid fluid, and, as far as he understood, it would not harden by simple exposure to the air.

The CHAIRMAN replied that a simple wound in the gutta percha covering would not be injurious to insulation in a land telegraph wire. The injurious effect would only take place in the event of water getting into the pipe. The moment the wound in the gutta percha rendered the insulation imperfect, the water would have the effect of healing the wound by its action on the viscid fluid.

Mr. THOS. WINKWORTH would take the liberty of asking one or two questions. Should any fractures occur in the cable, what provision was made for the fresh supply of the semi-viscid fluid which exuded or oozed out?

The CHAIRMAN.—When it is exhausted you cannot put in a fresh supply.

Professor HUGHES explained that there would be no more fluid exuded than was sufficient to fill up the space which was cut out. If they cut the gutta percha in the open air, no more fluid would ooze out than would be enough to fill the space, and therefore the quantity in the tube would be sufficient to fill up an innumerable number of small fractures.

The CHAIRMAN—Does the fluid harden by exposure to the air?

Professor HUGHES—No; but it could be easily made to do so.

The CHAIRMAN was still of opinion that it would be valuable as applied to land telegraph communication. He would inquire whether the application of the semi-fluid matter was very expensive?

Professor HUGHES replied that the cost was something below that of gutta percha. It could be placed within two coatings, or between the wire and the single outer coating.

Mr. HOBBS would ask what effect time would have upon this material? The substance might be very good when first applied, but in time its properties might be destroyed.

Mr. HYDE replied that time must answer that question. He was not able to do so at present.

Professor HUGHES said it had been tried under water for three months, and had been exposed to the atmosphere for six months, without any change whatever having taken place. It was not injured by the action of the atmosphere.

Mr. WINKWORTH would further inquire whether the printing instrument was in practical use for any great length of land wire, and on what length of circuits it had been worked?

Professor HUGHES said it was in practical use in the United States on six telegraphic lines when he left America, and that it had been worked over a circuit of 600 miles without relay. The right to use the instrument had been purchased by companies possessing 30,000 miles of telegraph in America.

Mr. WINKWORTH would like to be informed whether the instrument had been tried upon submarine wires; and if so, to what extent in length, and with what rapidity?

Professor HUGHES said it had been worked upon the Atlantic cable while coiled at Keyham, and also upon the Red Sea and Australian cables, through their entire length.

The CHAIRMAN inquired whether those experiments had taken place in the presence of witnesses.

Professor HUGHES said they were witnessed by several persons.

The CHAIRMAN added that it was satisfactory that Professor Hughes was able to state that the experiments were witnessed by several persons, as he was not aware that that fact had ever before been published. It was gratifying to know that messages were passed through the entire distance.

Mr. HYDE stated that the experiments were continued for several weeks during the shipping of the Atlantic cable at Keyham, in May last. The transmission of messages through the Atlantic cable was at that time slow, and at a much less rate than the instrument would be capable of accomplishing at the present time. Professor Hughes had made no experiments upon long submarine lines until he came to this country, and the first experiments were made upon the Atlantic cable. The instruments were timing instruments, and the rate of speed must be proportioned to the rate at which the electric wave would travel through the wire. When he was in America, he learnt from the elec-

trician's report to the Company that the rate at which the electric wave would travel through the Atlantic cable was equal to four words per minute with the ordinary Morse relay. The instrument of Professor Hughes, intended for land lines, would not move correctly at this slow rate, and therefore instruments were specially made with a minimum rate of speed of four words per minute, in accordance with the electrician's report. When Professor Hughes arrived at Keyham, he found that the rate at which signals could be transmitted through the Atlantic cable was less than had been stated in the report, and the instrument was not adapted to so slow a motion. After reducing it by temporary arrangements, he was able to transmit letters at the rate of two and a half words per minute. This was done in the presence of Mr. Field, the managing director, and some half-dozen other persons. Since that time the instrument had been tried upon the Tasmanian cable, 240 miles in length, and through that they worked 25 words per minute. Subsequently, experiments were made upon the Red Sea Cable, 1780 nautical miles in length, or nearly 2000 statute miles. Upon that cable they worked with perfect success, day after day, for a week, first upon 500 miles, then upon 800, then upon 1500, and finally upon the whole length of 2000 miles. The rate of speed through the entire length was between four and six words per minute. The rate over 1000 miles was from eight to ten words per minute; through 500 miles it was twenty words per minute. With reference to the semi-fluid substance, he had no desire to keep back any useful information, but they had been trying experiments for four months, in order to ascertain what combination of materials was best adapted for the purpose. Mr. Newton had referred to a cable constructed with a long tube filled with air as a non-conducting element. It appeared to him (Mr. Hyde) that as an insulator, the air would be far inferior to the fluid substance, or even to gutta percha. He also thought that if any fracture occurred in the coating, the pressure upon it would be such that the air would be displaced by the water. On the other hand, Professor Hughes had been seeking and had obtained a semi-fluid substance, every portion of the ingredients of which would be heavier than water. He would say with reference to the semi-fluid substance, that almost anything would make a semi-fluid substance. The question was—what was the best material? and this he did not feel disposed at present to develop. He would only say that ordinary oil or hydro carbons mixed with resinous substances would produce such a semi-fluid substance as would restore insulation. The merit of the invention consisted in the idea of the use of a semi-fluid material for this purpose, and not so much in the material used. Mr. Smith had suggested that means should be taken to test the action of this material under heavy pressure. His (Mr. Hyde's) impression always had been that the pressure would be equal upon all parts of a submerged cable, and therefore the fluid would be in the same position under a pressure of two miles depth of water as under two feet in a bath. They had, however, gone almost to the extent proposed by Mr. Smith. They had made the experiment with a pressure equal to

that of 3000 fathoms, or two miles, with perfect success, with the gutta percha incised before it was submerged. In one case the gutta percha was split from end to end and it came out perfect.

Mr. BEVAN referred to the recent experiments upon insulation made at the works of Messrs. Silver & Co., at North Woolwich. As far as he understood it, the insulation was effected by india rubber, and if a puncture occurred in the tube it would by the pressure be healed. Some credit was therefore due to the plan as being prior to that of Professor Hughes.

Mr. NEWTON said experiments as to the effect of pressure had been tried with the cable as designed by Captain Drayson, and it was found that with a pressure exceeding that of two miles below the surface, a puncture being made in the tube, the air was not expelled from it. In the case of a small fracture, such as a crack, it did not appear that the air escaped even when under hydraulic pressure.

Mr. HYDE was very glad to hear it; he thanked Mr. Newton for having mentioned the different modes of insulation that had come under his notice. He (Mr. Hyde), however, was not there for the purpose of criticising the inventions of others, but to illustrate and defend those of Professor Hughes.

Mr. SMITH said the question was, whether the material would exude from the tube, when cut whilst under pressure; he knew that in some experiments that were tried the fluid did exude. The cut was made whilst under pressure, and there was no balancing of the forces until some of the fluid had exuded, and some alteration in the dimensions had taken place.

Mr. TUCKETT submitted that upon the principle of hydraulic pressure, if the surface of the whole tube were greater than the surface which was not protected, the pressure being in proportion to the area, there must be exudation, and there would be a tendency to press the liquid out of the hole.

Mr. J. G. APPOLD, F. R. S., said, experiments showed that there was no exudation. It made no difference whether it was under pressure or otherwise.

Mr. HYDE, to meet the hydraulic point that had been raised, would ask whether the pressure upon each point would not be the same? To get the fluid to ooze out, they must have a point free from pressure. The pressure was equal on all parts of the cable.

The CHAIRMAN said, this point had been proved by experiment.

Professor HUGHES remarked that the fluid, being heavier than water, was not displaced by the water.

The CHAIRMAN would wind up this discussion with a few observations, one being not so much applicable to telegraphic communication as to the objects and action of this society. When he first joined the Society, about 24 years ago, before the revolution in its operations took place—for it was more than a reformation—no patent scheme could be brought before the Society. It must have been an invention thrown open to the world. The revolution to which he had alluded, brought about a great change in this respect; and he thought one of

the greatest boons the society now conferred, was the encouragement it gave to patentees to come with their inventions as soon as they were in a condition to do so, and allow them, as had been done by Professor Hughes and Mr. Hyde that night, to give them such information as they could, without injury to their interests. Mr. Newton had a perfect right to ask for the information he was desirous to obtain; but, at the same time, there was no improper selfishness in Mr. Hyde refusing to communicate it; he had a perfect right, if he chose, to keep the secret to himself. The application of india rubber for the purpose of insulation was not new; it had been used in single, double, and treble coats for the last 20 years. The great improvement consisted in thoroughly uniting the edges of the india rubber by means which could not injure it in its non-conducting character, or lead to the ultimate decomposition of the material itself. The solutions formerly employed for the purpose were injurious to it; and he was happy to say there were two or three plans then under consideration which gave good promise of success. These, however, had nothing to do with the beautiful idea of placing within the gutta percha a material capable of healing those wounds which arose from the defects existing more or less in all impure gutta percha—such as air bubbles, small particles of fibres, or wood, or indeed from any defect whatever. He was sure he was only expressing the feelings of the meeting in proposing a vote of thanks to Mr. Hyde for the paper he had read, and also to Professor Hughes for the illustrations he had given of his beautiful apparatus, and the explanations he had afforded upon this very interesting subject.

A vote of thanks was then passed to Mr. Hyde and Prof. Hughes.

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*Coal as an Aid to Industrial Progress.**

Questions of high economical value arise out of the possible development of the great coal fields of the United States, which comprise no less than 196,850 square miles—added to which the British provinces contain 7530 square miles. These coal areas are amazing and may be productive of immense commercial results in the far future. When we reflect upon what has been acheived by the produce of the coal fields of Britain, mere specks compared with those of the United States, and in figures amounting only to 5400 square miles,—when we further consider the total coal fields of Europe, and find them only 8964 square miles—and then endeavor to anticipate the mining of the enormous fields of the United States upon an extensive scale, we are led to forecast a future of almost boundless enterprise for that wonderful country. An estimate of the probable produce of the American coal fields may be formed from some data afforded in an excellent work just published by Prof. Rogers, on the Geology of Pennsylvania. Averaging the total thickness of the workable coal in Great Britain, at 35 ft., we have a total of workable coal equal to 190,000,000,000

* From the Lond. Mining Journal, No. 1230.

tons. In the same way, estimating the total area of the *productive* coal fields of North America as 200,000 square miles (that is inclusive of the British provinces) and averaging the thickness of good workable coal at 20 ft., a result of 4,000,000,000,000 tons is gained, Or, to make these results more appreciable, if we take the amount of workable coal in Belgium as 1, then that in all the British Islands is rather more than 5, that in all Europe 8¾, and that in all the coal fields of North America is 111. This method of ratio is more intelligible than that of relative superficial magnitudes—and we at once perceive that the United States possess more than twenty-two times our amount of coal. We apprehend, however, when mining discovers more fully the character of the American coal, that the superiority of our best bituminous coal will in a large measure compensate for our smaller quantity.

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*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. ALFRED VARLEY, Assoc. Inst. C. E.

(Continued from page 61.)

The correctness of considering the inductive phenomena which manifest themselves in subterranean and submarine circuits, as a new fact suddenly brought to light, has been called in question in the early portion of this paper; a few words on its history will therefore not be out of place, before considering the way in which it affects telegraphing.

In 1838, Dr. Faraday pointed out the conditions which would cause the retardation of an electric impulse in its passage through a conductor.

In 1848, the electric telegraph was in actual operation. The method adopted at that time for the insulation of the wires passing through towns, was to enclose a number of cotton covered wires in a leaden tube, and then fill the tube with a mixture of resin and Stockholm tar.

Reasoning on Dr. Faraday's observations, my brother, Cromwell Varley, was led to think that such circuits possessed conditions favorable for induction to manifest itself; he therefore searched for it, and succeeded in obtaining indications of induction.

In 1849, gutta percha had been introduced, and as the insulation in gutta percha covered wires was much more perfect than in the cotton covered ones enclosed in leaden pipes, induction manifested itself much more strikingly, and my brother made use of, from that time as a more searching test of perfection of the insulation than the deflection of a galvanometer, the capability of the wire to retain for a certain period the induced charge, and he stood alone for some time in making use of this test, others not having faith in it at that period, and in the same year he obtained indications of induction in an overground circuit.

In the latter end of the year 1851, my brother was enabled to experiment upon a length of ten miles of gutta percha covered wire.

* From the Jour. of the Society of Arts, No. 332.

At these experiments I assisted, and the conclusion he arrived at was, that if gutta percha covered wires were employed for circuits of any length, as was at that time proposed, induction would manifest itself so powerfully, as to offer serious obstacles to telegraphing with the apparatus then in use, the truth of which prediction was subsequently verified. In Prussia, however, as early as 1850, Mr. W. Siemens had employed gutta percha covered wires for circuits of considerable lengths, and encountered the inductive phenomena, an account of which he published during that year.

This fact was not known on this side of the channel until after gutta percha covered wires throughout the whole lengths of the circuit were also employed in this country, and that was in the year 1854.

To Dr. Faraday, however, is due the whole credit in this matter, and I have only alluded to its telegraphic history, as I cannot help feeling it as a sort of reproach to practical electricians that it should go forth that induction, which was manifesting itself step by step before their eyes, came suddenly and unexpectedly upon them. The following extract from Dr. Faraday's researches of 1838 is so instructive, and teaches such a valuable lesson, that I cannot refrain from quoting it. Alluding to Professor Wheatstone's well-known experiment, he says,—"If the two ends of the wire were immediately connected with two large insulated metallic surfaces exposed to the air, so that the primary act of induction, after making contact for discharge, might be in part removed from the internal portion of the wire at the first instant, and disposed for the moment on its surface, jointly with the air and surrounding conductors; then, I venture to anticipate, the middle spark would be more retarded than before, and if these two plates were the inner and outer coatings of a large jar, or Leyden battery, then the retardations of that spark would be still greater."

Previous to the first attempt to submerge the Atlantic cable, a series of experiments were undertaken by the company's late electrician, and the result published.*

These experiments having been tried, at the expense of much capital, and with opportunities which never before presented themselves, are too important not to be noticed, though it is believed that the author of them has lately had reasons to modify some of his conclusions.

The chief results published were these:—

1. That no adequate result is obtained by increasing the sectional area of the conductor; that, in fact, in the case of a submarine circuit —a small wire will transmit signals more rapidly than a larger one.

2. That an insulated submarine wire conducts according to a different law to that of a suspended circuit.

3. That the rate at which a voltaic signal travels is not affected by the intensity of the battery.

4. That magneto-electric induced currents have the property of traveling in the first place faster than voltaic ones; and, unlike voltaic currents, when their intensity is increased their rapidity of traveling is increased also.

* *Vide*, "The Atlantic Telegraph. A History of Preliminary Experimental Proceedings, &c., published by order of the Directors of the Company."

In the paper I submitted last March to the Institution of Civil Engineers, I pointed out what I conceive to be errors in these results, and endeavored to show that some of them necessarily followed from the way in which the experiments were conducted, and I cannot more clearly express what I wish to convey on this head than by quoting my own remarks on that occasion.

"In examining these conclusions, it has first to be considered whether the conditions of a submarine circuit and a suspended one are different. In a suspended wire, the insulating medium of the air takes the place of the gutta percha of the submarine circuit. The earth, which is the nearest conductor, is a considerable distance off, and is only on one side of the wire, therefore but little induction can take place between the wire and the earth; nevertheless, induction to a certain extent does take place, and can be perceived in circuits of very moderate length.

"The author has noticed indications of it in a circuit 60 miles long, and he feels confident that with delicate apparatus it could be perceived in much shorter circuits. If the distance between the wire and the earth were decreased, induction would be developed more strongly, and the wire could be brought down step by step until the condition of a submarine circuit would be approached, where the earth surrounds the circuit on all sides, and is only separated from it by the thickness of one-eighth or three-sixteenths of an inch of gutta percha—a substance possessing, moreover, specifically a much greater inductive capacity than air. It, therefore appears, that the conditions are precisely the same, only differing in degree. Before proceeding further, and to prevent the possibility of mistake, it is desirable to make the following quotation from the work previously referred to:—*

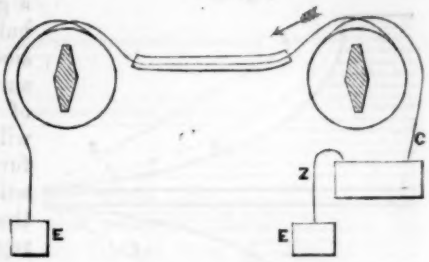
"'The law of squares may possibly apply to the transmission of electricty freely along simple conducting wires, but it certainly does not apply to the case of its transmission along submarine and subterranean gutta percha covered wires (the facility of transmission being estimated by rate of speed) because in this the case is not one of simple conduction, but of transmission, after the wire has been charged inductively to saturation as a Leyden jar.' This quotation shows clearly the reason for concluding that small wires are better conductors for submarine circuits, as far as transmission is concerned, than larger ones; for the smaller the Leyden jar the more quickly will it be charged to saturation. The author, in differing from these conclusions, does not wish it to be understood that he thinks the law of squares is applicable to submarine wires; for he is not aware of any electrical phenomena which obey that law, but he submits that there is a material difference between a Leyden jar and a submarine wire.

"In a Leyden jar the inner and outer coatings are perfectly insulated one from the other. If they were not insulated there could be no statical charge, as is well understood by all electricians. Induction therefore *involves insulation.* But in a submarine circuit this is not the case. If the wire at the further extremity was disconnected from the telegraph instrument, and sealed up with gutta percha, the condi-

* *Vide*, "The Atlantic Telegraph," page 23.

tions would be nearly the same. In practice, however, it is quite open through the instrument to the earth, and the resistance opposed by the very long length of wire is the only insulation between the inner and outer coatings, for it unites both, being in connexion with the earth at both ends (Fig. 5). It is therefore evident that if the wire offers no resistance there will be no insulation, and, as a consequence, no induction to retard the passage of the current. It is also equally plain that precisely in proportion to the resistance which the wire opposes, provided always the insulating medium be of the same thickness, will induction manifest itself and retardation be experienced.

Fig. 5.



"There is also another difference between a Leyden jar and a submarine circuit.

"The Leyden jar is charged uniformly all over, whilst in a submarine wire the tension of the charge varies in different portions of the circuit, being at its maximum at the end where contact is made with the battery, and dying off to nothing at the further extremity."

The next consideration is the part induction plays in submarine circuits of any considerable length.

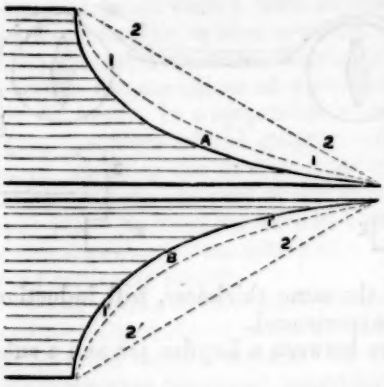
In a submarine circuit the wire is insulated from the earth by only a thin layer of gutta percha; the conditions, therefore, are favorable for induction through the insulating material; the conductor, itself, from its great length, opposes very great resistance, or, in other words, insulates to a very considerable extent.

When a battery is connected to send a current, the first impetus is in part directed forward, in part diverted laterally; but as the wire opposes considerable resistance to the passage of the electricity which the battery can generate, whilst the thinness of the insulating material is very favorable for induction taking place through it, the greater portion of the first rush will be occupied in charging the wire statically at the battery end; as, however, it is a balance of forces between the resistance which the wire opposes on the one hand, and the ease with which lateral induction can take place on the other, a very minute portion must pass through instantly, and the period which will elapse between the making contact with the battery and the observing the current at the further extremity, will depend upon the capability of the instrument to record very small quantities of electricity.

In fact, immediately on contact being made with the battery, a wave will be formed throughout the length of the wire, somewhat like what is shown in the diagram (Fig. 6), which is intended to represent a submarine wire the moment after contact has been made with the battery. The line A represents the internal charge having its maximum tension at the battery end, and diminishing in intensity as it approaches the

farther extremity. The line B shows the induced charge of the opposite kind on the outer surface of the gutta percha, and forms an exact counterpart to the internal charge, with the exception of being a little less intense; for as it is spread over a greater surface, and only exactly balances the internal wave, its tension will be less in proportion as its surface is greater. As the tension of the statical charge is raised, so will the flow of electricity at the further extremity increase; both will arrive at their maximum together; the current will then flow in a regular stream as long as contact with the battery continues. The dotted lines 1 1 and 1′ 1′ are intended to represent the waves after the contact has been made a short time, and the lines 2 2 and 2′ 2′ are intended to represent the waves when they have attained their maximum height.

Fig. 6.



In the last case they will be perceived to be more regular.

When the battery has been disconnected from the wire, the opposite waves will still continue to unite, but the rate of flow as the tension falls will become slower and slower.

In theory the time which would be occupied by a wire discharging itself completely in this way would be infinite. In practice the wire requires a very appreciable time to charge, and a longer period to discharge. The effect of this is, that if currents are sent at all rapidly one after the other, instead of obtaining a series of distinct impulses at the further extremity, an undulating continuous current is received; and, as to obtain a telegraphic signal, the wire has not only to be charged to a certain degree of tension before an appreciable current is received at the further end, but has also to be discharged afterwards before another signal can be sent, the impulses which are obtained through such circuits as these are very sluggish.

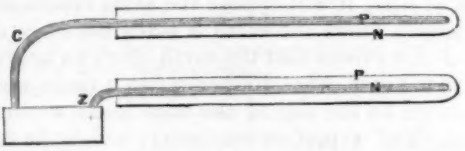
The problem to be solved is, the best means of reducing the amount of induction, and of mitigating its effects.

Almost the first remedy suggested when this inconvenience was experienced, was to substitute another insulated wire in the place of the earth for a return circuit, for it was argued that, as in this arrangement, one wire would be charged positively and the other negatively, they would neutralize one another.

This suggestion was put to the test and failed. Since that time the same plan has been revived by several others; a good deal of argument has also been brought forward lately in support of it, and even amongst those who know its practical inutility there would seem to have been lurking some faith in the capability of the method (in theory at least,) to neutralize the effects of induction.

The explanation of its failure, if we are guided by the first principles of the science, appears to me to be very simple, and I expect not only to make it plain that no advantage is to be obtained by the adoption of this method, but that it will increase the retardation.

Fig. 7.



Let two long gutta percha covered wires, (Fig. 7,) buried in the earth, be connected, one with the zinc pole and the other with the copper pole of a battery, and let the farther ends of each of these wires be hermetically sealed. The earth, from its mass, being a perfect conductor, its action, it is evident, will be the same as if metal tubes in metallic communication with each other surrounded the gutta percha wires. It is therefore clear that the only retardation to induction will be the thickness of the gutta percha covering, and the tension of the statical charge will be in accordance with the intensity of the battery. Now consider the case of a similar gutta percha wire of the same length (Fig. 8) as one of these, but in which one pole of

Fig. 8.

the battery is connected to the earth and the other to one end of the metallic conductor, and the circuit completed by connecting the further extremity to the earth. It will also receive a statical charge to a certain degree, but the tension of the charge will not, *ceteris paribus*, be dependent upon the intensity of the battery, but upon the resistance which the wire opposes, for it has already been shown that this is the only real insulation between the wire and outer coatings, and that the degree to which statical charge can take place depends on the amount of insulation existing.

Fig. 9.

Now, let the ends of the two wires which are hermetically sealed be connected to each other, (Fig. 9,) the circumstances are quite as favorable for induction as in the wire in which one end was connected with the earth, but there will be twice the resistance; in other words,

double the amount of insulation, and, consequently, a proportionate increase in the amount of induction.

Another view of this matter will perhaps assist to confirm what has just been stated.

It is a well established fact that when a telegraphic circuit is composed of a loop of wire, it will oppose the same resistance as a circuit of double the length where the earth is made use of in the place of a return wire, and this proves that the earth offers no appreciable resistance. If this be the case, what difference can it make whether the battery pole be carried to the end of the wire itself, or through the medium of any length of a perfect conductor, which the earth has been proved to be? Therefore, it would appear that the induction which would be manifested in a circuit composed entirely of an insulated conductor, would be the same as that in a circuit of twice the length, where one-half the circuit is completed by the earth, and the only difference which would exist between the one and the other would be, that in a circuit composed entirely of wire, the statical charge will be distributed more uniformly throughout the entire length.

But, says a writer on this subject, I admit that no advantage would result if two separate wires are used, and which will therefore necessarily be some distance apart from one another, but place the two wires in the middle of a mass of gutta percha, (Fig. 10,) and so close to each other that they may become virtually the centre of a system, and let the insulating material be of considerable sectional area, then no induction worth naming will take place between the wires and the earth, and the inductive influence of the positive wire will neutralize that of the negative wire.

Fig. 10.

Fig. 11.

The fallacy of the proposition will be at once seen if it be carried out more fully. Instead of letting the wires lie side by side, let the one wrap over the other, and be, in fact, a tube with a thin mass of insulating material between it and the inner wire (Fig. 11.) They will now become really the centre of the system, and fulfil completely the object desired by the author of this suggestion, but is it not evident that such an arrangement is the fac-simile of a Leyden jar, and will not the conditions be the most favorable that can be conceived for the development of induction?

The only remedy which has been successful in mitigating the effects of induction, is that of throwing into the wire, immediately after a current has been sent, another of the opposite kind; this absorbs and neutralizes the preceding wave much more quickly than when the wire is left to discharge itself in the ordinary way. This method, however, does not reduce the induction, but only mitigates its effects, although in circuits of moderate length its adoption has, for practical purposes, completely removed the inconveniences arising from the induced charge.

(To be Continued.)

For the Journal of the Franklin Institute.

Particulars of the Steamer Yorktown.

Hull built by Wm. H. Webb. Machinery by Morgan Iron Works, New York. Intended service, New York to Richmond.

HULL.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,		250 feet.
Breadth at midship section,		34 "
Floor timber—molded, 15 ins.—sided, 15 ins.		
Frames—apart at centres, 2 feet 6 inches—strapped with double laid iron straps, $4\frac{1}{2} \times \frac{3}{4}$ inches.		
Depth of hold,		9 " 6 inches.
" to spar deck,		17 "
Length of engine and boiler space,		78 "
Draft of water at below pressure and revolutions,		11 "
Area of immersed section at this draft,	330 sq. ft.	
Tonnage,	1400.	
Contents of bunkers in tons of coal,	150.	
Masts and rig—Fore-topsail schooner.		

ENGINES—Vertical beam.

Diameter of cylinders,		50 inches.
Length of stroke,		10 feet.
Maximum pressure of steam in pounds,	25.	
Cut-off—half stroke.		
Maximum revolutions per minute,	20.	

BOILERS—Two—Single return through two tiers of flues.

Length of boilers,		34 feet.
Breadth "		14 "
Height " exclusive of steam chimney,		12 " 6 inches.
Number of furnaces,	6 in all.	
Breadth "		4 " 2 "
Length of grate bars,		7 "
Number of flues,	28.	
Internal diameter of flues,	19, 16, and 11 "	
Length of flues,	27 and 21 feet.	
Heating surface (fire and flue),	6000 sq. ft.	
Diameter of smoke pipe,		6 feet 8 "
Height "		39 "
Description of coal,	Anthracite.	
Draft,	Natural.	
Consumption of coal per day,	26 tons.	

PADDLE WHEELS.—

Diameter,		30 feet.
Length of blades,		9 "
Depth "		18 inches.
Number "	26.	

C. H. H.

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*Chromo-Photography.**

An invention which is destined, no doubt, to create a revolution in the art of photography has recently been made by Mr. Backshell, of the Photographic Institution, Durham-place, Dalston, and which has received the protection of her Majesty's royal letters patent. It consists in producing, what has hitherto been considered impossible, a

* From the Lond. Mechanics' Mag., Sept. 1858.

beautifully-colored non-inverted photograph, equal in brilliancy of color and superior in detail to the most exquisite miniature extant. We understand that the studio of Mr. Backshell has been honored by the visits of several of the nobility and gentry, who have testified their appreciation of the invention by numerous orders. Licenses for the practice of the invention are being granted throughout the kingdom.

For the Journal of the Franklin Institute.

Particulars of the Steam Frigate General Admiral.

Hull built by Wm. H. Webb. Machinery by Novelty Iron Works, New York. Intended service, Imperial Russian Navy.

HULL.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,	308 feet 6 inches
Breadth of beam at midship section,	54 " 6 "
Depth of hold to berth deck,	18 " 3 "
" " spar "	33 " 7 "
Floor timber, at throat—molded, 1 ft. 10 ins.—sided, 16 to 25 ins.	
Frames—apart at centres, 3 feet 2 inches.	
Length of engine and boiler space,	104 "
Draft of water at load line,	23 " 6 "
" below pressure and revolutions,	22 "
Area of immersed midship section at this draft, 836 sq. ft.	
Tonnage, custom-house,	4306 92-95.
Contents of bunkers in tons of coal,	650.
Masts and rig—ship rigged.	

ENGINE.—Two—Horizontal—Back action.

Diameter of cylinder,	84 inches.
Length of stroke,	3 feet 9 "
Maximum pressure of steam in pounds,	20.
Cut-off—half stroke.	
Maximum revolutions per minute,	52.
Weight of engines,	175 tons.

BOILERS.—Six—Horizontal tubular.

Length of boilers,	10 " 3 inches.
Breadth "	19 and 22 "
Height " exclusive of steam chimney,	12 " 6 "
Weight of " without water,	250 tons.
Number of furnaces,	38.
Breadth "	2 " 7 "
Length of grate bars,	7 " 6 "
Number of tubes,	2760.
Internal diameter of tubes,	3 "
Length of tubes,	7 "
Heating surface,	21,000 sq. ft.
Diameter of smoke pipe,	11 "
Height "	65 "
Draft,	Natural.
Consumption of coal per hour, maximum,	4 tons.

PROPELLER.—

Diameter of screw,	19 feet.
Pitch "	31 "
Length of blades,	7 "
Number "	two.
Geared—Direct action.	

C. H. H.

*Production of Engravings by Photography.**

There are, as is now tolerably well known, two or three processes for the production of engravings by photography—the chemical agent in them being the bichromate of potash. M. Jobart not only introduces a material new for this special purpose—but he has shown that the well-known material, the iodide of silver, possesses a new property which renders it available to this end. A lithographic stone, or a plate of zinc, is covered with the iodide of silver, and a picture obtained upon it in the usual manner. It is then immediately covered with a thick solution of gum arabic mixed with lampblack and placed aside in the dark. When the coating of gum is thoroughly dry the stone or the zinc plate is plunged into water. The parts over which the iodide has been decomposed are removed with the gum, and all those parts receive the lithographic ink readily, while the other parts resist it. Thus the stone or zinc plate is at once prepared, and, says M. Jobart,—who makes this communication to the Academy of Sciences of Paris—we obtain thus the whites pure and the proofs perfect in all their details—but the operation is a delicate one.

Mineral Statistics of Great Britain.†

An interesting return has recently been published by order of the Lords Commissioners of the Treasury, by the Museum of Practical Geology, showing the quantity of mineral ore obtained from the British mineral districts during the past year. The following are the principal points of interest:—The quantity of pig iron made in 1857 was 3,659,447 tons,—being an increase, notwithstanding the depression of the iron trade, of 73,070 tons over the quantity produced in 1856. The importations of tin ore, including 816 tons from our colony, Victoria, amounted during the past year to 4095 tons. Under the head of copper there is considerable difficulty in arriving at a just estimate of the produce, from the circumstance that very large quantities are purchased by private contract, alike from British and Foreign mines, and it is almost impossible to separate these. It is believed, however, that this has been more closely effected in the present return than has been done in any former year. The purchases of the Copper Company in Cornwall, for 1857, show a decrease of 1414 tons; and those in Swansea, of 840 tons upon the previous year. The exports have been in 1856, 22,863 tons; and in 1857, 25,241 tons. The production of lead has been, in 1856, 73,129 tons; and in 1857, 69,266 tons;—of silver in 1856, 614,188 oz.; and in 1857, 532,866 oz. The importations of lead exhibit a falling off of about 3000 tons; and of foreign silver ores, instead of 6,636 tons, the quantity brought into this country in 1856, we only imported 5190 tons,—being a decrease of 1440 tons. The return of coal production is a remarkable test of the depression of commerce during 1857. For while the quan-

* From the Lond. Athenæum, Feb., 1859.
† From the Lond. Athenæum, December, 1858.

tity produced and sold in 1856 amounted to 66,645,450 tons, that of 1857 was only 65,394,707 tons,—being a falling off of 1,250,743 tons. The following tables show the values of the mineral and metallic produce of the United Kingdom in 1857, excepting clays and stones:—

MINERALS.

Tin ore,	£ 743,508
Copper ore,—the product of all the sales, excluding foreign ores, but including private contract purchases,	1,560,922
Lead ore (containing silver),	1,428,095
Zinc ore,	30,982
Iron pyrites,	63,804
Arsenic,	919
Nickel and Cobalt,	219
Iron ore,	5,265,304
Coals,	16,348,676
Salt,	506,720
Barytes and other minerals,	12,500
	£ 25,961,649

METALS.

Tin,	£867,680
Copper,	2,166,900
Lead,	1,523,852
Silver,	133,216
Zinc,	450,000
Pig iron,	12,838,560
Other metals,	125,500
	£ 18,105,708

The returns have been compiled by Mr. R. Hunt, and comprise many details of considerable interest.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 21, 1859.

John C. Cresson, President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter from the American Institute, of the City of New York, was read.

Donations to the Library were received from the Commissioners of Patents, the Royal Astronomical Society, and the Statistical Society, London; the Catholic University of Ireland, Dublin; des Oesterreichischen Ingenieur-Vereines, der K. K. Geologischen Reichsanstalt, der K. K. Geographischen Gesellschaft, Vienna, Austria; the Board of Arts and Manufactures for Lower Canada, Montreal, Canada; Prof. A. D. Bache, U. S. Coast Survey, Washington, D. C.; Hon. David Dale Owen, Little Rock, Arkansas; the American Institute, City of New York; the North Missouri Railroad Co., St. Louis, Missouri; B. H. Latrobe, Esq., C. E., Baltimore, Maryland; the Board of Water Commissioners of the City of Detroit, Michigan; the N. O. Academy of Science, New Orleans, Louisiana; the Young Men's Mercantile Library Association, Pittsburgh, Penna.; Messrs. Jones, White, and McCurdy, Prof. John F. Frazer, and the Board of Trade, Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of June was read.

The Board of Managers and Standing Committees reported their minutes.

One resignation of membership in the Institute was read and accepted.

Candidates for membership in the Institute (8) were proposed, and the candidates (7) proposed at the last meeting were duly elected.

The President made a brief statement relative to the hail storm and tornado which passed over the northern part of the City on the afternoon of July 20th.

From an elevated position he had a full view of the storm when distant about 6 miles to the N. W. A portion of the cloud, apparently about half a mile wide, appeared pendant from the main body, reaching to the ground; within this chimney-like column there was evidently a violent upward movement, the masses of cloud being carried up with great velocity as soon as they formed, and vivid streaks of lightning traversed vertically near the centre of the column.

The form of the whole cloud was that of an enormous mushroom, with a stem more than 2000 feet in diameter, and a head several miles across.

Mr. Wm. Stacey exhibited a spring balance, designed by Mr. Dana Bickford, of Westerly, R. I., as a substitute for the weights ordinarily used to balance window sashes; it consists of a coiled spring contained within a cylindrical band, to which its outer extremity is attached, whilst its inner extremity is attached to a fixed pin, about which the band rotates; the whole is mounted in a box which is intended to be let into the window frame near the top of the sash. A cord is attached by one end to the sash, whilst the other is attached to the band enveloping the spring, which is wound up, so as to give a tension sufficient to balance the sash. It is claimed to be cheaper than the old method, as no boxing is required for the weights.

Also, Mr. A. W. Decrow's safety alarm drawer lock, which can be put upon an ordinary drawer at a slight expense. The alarm is operated by the endeavor to open the drawer, unless three projecting pins on the under side of the drawer, which permit of combinations, are moved into the propor positions by the fingers as they fall upon them in the act of pulling the drawer outwards. In that case, the drawer opens without noise; but, if the combination is not the proper one, a catch, which projects upwards within the drawer, not only prevents the opening, but, by its contact with the containing frame of the drawer, releases a catch which sets a bell ringing, thus notifying the proprietor.

Messrs. Code, Hopper & Co., had upon the exhibition table, for inspection and trial by the members, a spirometer registering to the tenth part of a cubic inch. It has the same internal mechanism as a dry gas metre, and is a handsome specimen of their manufacturing skill.